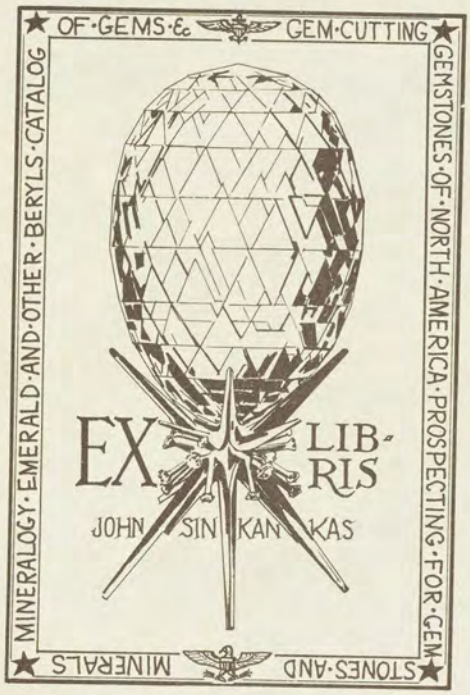
OF·GEMS·&c
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British Mineralogy

or

coloured figures

intended to elucidate

The Mineralogy

of

Great Britain

By Martha Proby

From James Sowerby, F.L.S.

Honorary member of the Physical Society of Göttingen,

Designer of English Botany, Author of English Fungi, &c.

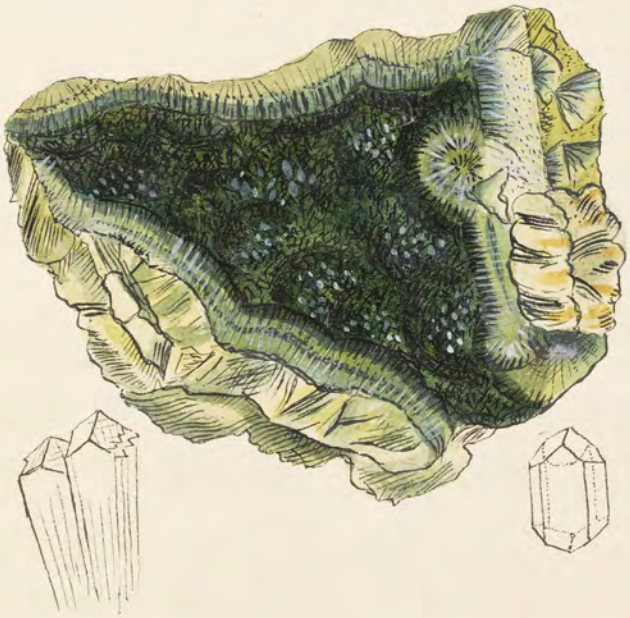
VOL. I

Novr 1845

Robt. Sticht,
1903.

Tab. 1.

This arsenite of copper has the appearance of cubic crystals of Arseniate of Iron on the apex or ends of the radii of red-copper. However a good crystallographer may find out the real conformation; Tab. . and . show the nature of this modification, and it is only a series of radiating, or partly radiating crystals, which ~~coral~~ crowd together wedge-shaped as happens with calcareous Spar, terminating with octaedrons so crowded as to show in general only as much as resembles the sides of a cube placed obliquely with the edge upwards: see the left-hand figure. The other outlines show how it accords with the modification of the preceding figures. There is a tendency to a concave formation of the faces which belongs to this octaedron, & often may be seen in cubes of Arseniate of Iron, tab. : it in some measure aids the deception. The Arseniate of Iron is generally of a yellow-green. The Arseniate of Iron Copper in this and table 1952 . rests upon Quartz in part crystallized, but chiefly in broken fragments mixed with Oxide of Iron.



2-170

Arseniate of Copper.

Tab. 2.

Plumbum cupreo-antimoniatum sulphuratum.

Sulphurated Cupreo-antimoniated Lead.

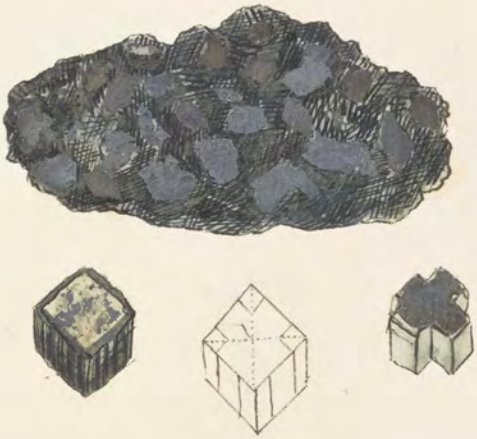
Class 3. Metals. Ord. 1. Homogeneous.
Gen. 15. Lead. Spec. 3. Sulphuret of Lead.

Syn. Triple Sulphuret of Lead, Antimony, and Copper. Bournon & Hatchett in Phil. Trans. 1804. Part I.

Ore of Antimony. Rashleigh, v. 1. pl. 19.

This comes from Fluel Boys in the parish of Endellion, in Cornwall, and has been always rare, and was supposed to be a Sulphuret of Antimony, until Mr. Hatchett analysed a substance nearly related to it but somewhat lighter-coloured, and found in the same mine - see pl. 5 which agrees with it in the nature of its crystallization, as is pointed out with

much ingenuity by the Count de Bournon in the Phil. Trans. They are found to be triple sulphurets, and when most pure contain chiefly Lead, Antimony and Copper in the metallic state in union with Sulphur. Thus the whole becomes a cupreous antimoniated Galena, and, as most related to Lead Ore or Galena, we name it as above. The present specimen is, as it were passing into this triple, as one of the common appearances of Sulphuret of Antimony is with it in the form of hairs and spicula, and the crystals are composed of, bundles of fibres, making a more or less complete modification, and accumulating in whorls or in crosses. See the right and left hand figures. The signs of the primitive cube are distinctly seen on the ends of the groups, and the reverse of the same figure; but it is difficult to see the primitive fracture, as, although they have a loose appearance, they are so incorporated that they fracture most like a compact glassy substance, conchoidally and irregularly. We had the luck to find one fractured face which may agree with the Counts ideas. In this there is the cubic sign of the primitive with the edges levelled at an angle of 150° on the upper face, and of 120° on the prism, nearly as the Count de Bournon observes.



Cupreous Antimoniated Sulphuret of Lead.

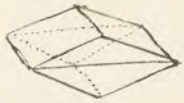
8

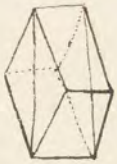
Tab. 3.

Plumbum carbonatum octaedrum.

Octaedral Carbonate of Lead.

This specimen came from Hatfield near Lossie Mouth, Elginshire, it is curious for having an octaedral crystal near by resembling, at first sight, the secondary one figured by Haüy, pl. 67. fig. 46. There are the 4 faces of the primitive octaedron as mentioned by Haüy, fig. 45. M: see the trapezoidal face. It has also four triangular faces agreeing with 4 of fig. 50 - Haüy. This specimen is an example of a hard flinty rock holding Galena, or common Lead ore, sufficiently good to tempt the miner; but the hardness of the rock is an obstacle not easily overcome without an amazing expense. There is perhaps an additional hope to the owner that he may not be aware of, which is, that Phosphate of Lead accompany the Galena; and where these are, the rock is fissile, and more easily acceptible. The situation, as to distance of fuel and convenience for smelting, is certainly to be considered.





Octaëdral Carbonate of Lead.

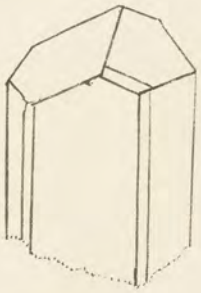
12

Tab. 4.

This pretty specimen came from Monymusk & is rather of an unusual colour and appearance, having additional bevillings and truncations; viz. two on each of the more obtuse edges of the prism, forming four additional faces, and making in all ten faces to a prism and two small faces on the apex. Feldspar differs in specific gravity from 2·272 to 2·7043. Under the blowpipe it melts ~~with~~ into a whitish glass without addition. It also varies in analysis, containing

Silex from	·43 to 70
Alumina	·14 — 37

Lime, sometimes Oxide of Iron, and also Potash; Baryta and Magnesia, according to Kirw.



Crystallized Feldspar a Variety.

18

Tab. 5.

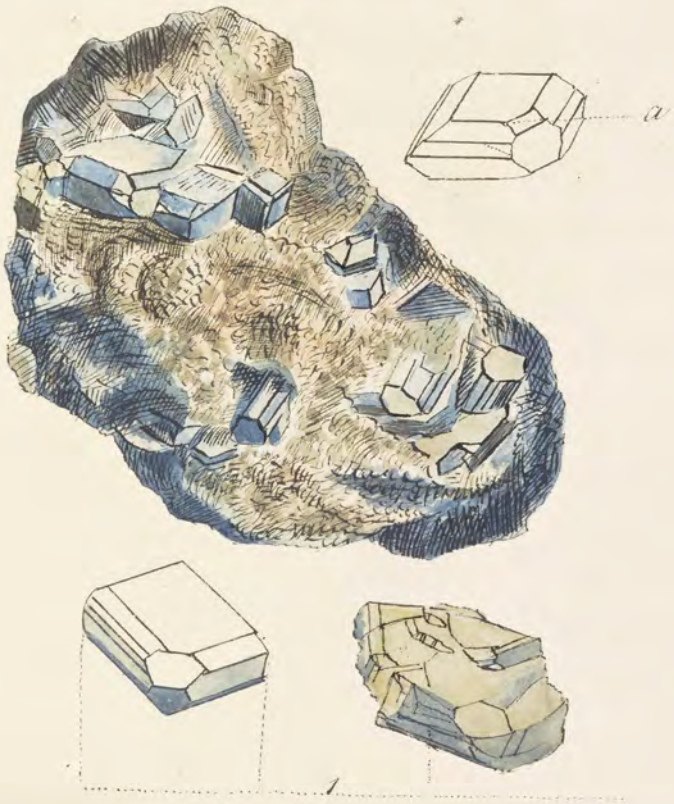
From the purity of these specimens, which were lent me by Mr. Richard Phillips, resulted a most perfect analysis by Mr. Hatchett, who has determined the proportion of the substances in it: and the largness of the crystals has been the cause of Count de Bournon's determining the primitive crystal and modifications, which is so difficult, as he observes, from the irregularity of their increase. The primitive, as he remarks, is a rectangular tetraëdral prism, which has its terminal faces perpendicular to its axis. Thus it is a sort of cube, and from observation on my specimen (see tab. 2) I find the integrant molecule may be a triëdral prism, four of which make a cube. We have here figured what appears to be one of the largest crystals that have yet been seen. It is terminated at both ends with short columns in the form of plates, and stuck sideways on the gangue; the column forming pentaëdral faces, chiefly on account of the deepness of the other faces, and the decrease towards the middle, mentioned at tab. . Thus the face decreasing on the column is reduced to a small triangle: see right hand figure. On this crystal we also observe another modification that has

not yet been mentioned by Bournon, viz: the upper face on the corner of what he calls the primitive prism; forming from the terminal face probably at the same angle ~~wh~~ with those on a line with the prism: see figure a.

Mr. Hatchett after a careful analysis, found it to contain:

Lead	42·62
Antimony	24·23
Sulphur	15
Copper	12·80
Iron	1·20
Loss	2·15
	100·00

It is of a paper colour, and much more fusible than Galena, as it melts before it is red hot; it leaves a cupreous residuum, whereas the fibrous part — tab 2 — leaves scarce any. Its lustre is very great. Fig. 1 points out the faces of the column which are very small. The right based figure is the natural crystal. and the left hand geometrical outline, to explain the faces above and below the column.



Cupreous Antimoniated Sulphuret of Lead.

Tab. 6.

Ferrum Sulphuretum.

Sulphuret of Iron, or Iron Pyrites.

Dio. 2. Imitative.

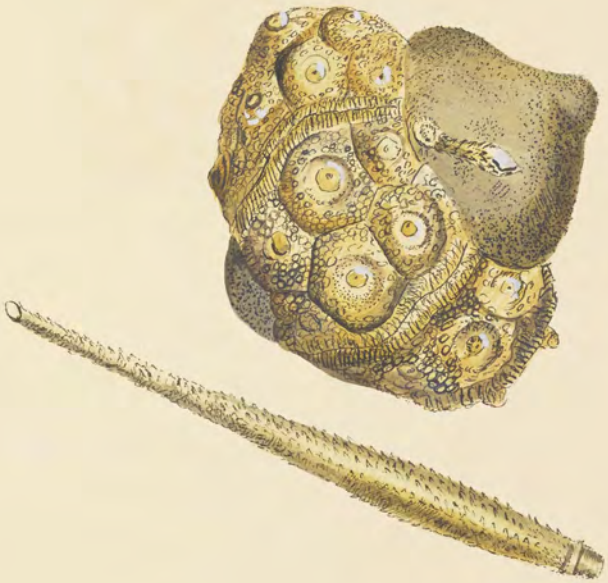
This specimen shows the cast of an Anomia surrounded by Pyrites, and the place formerly occupied by the shell remains nearly empty. It is extremely curious, that the Pyrites, in solution, should have formed the cast and enclosed the whole, & by some agent afterwards the shell should have been dissolved. L^d. Altamont's finding Gypsum enclosed in Pyrites would perhaps account for this if we had found gypsum in the place where the shell had been or near it; for the sulphur in an acidulous state might have combined with the lime.

This came from near Mount Pleasant, which place is noted for its numerous fossil productions.

Iron Pyrites containing the cast of an Ammonia.

Tab. 7.

The apparent loss of the animals in these Echini is as yet unaccounted for, and an immense quantity must have been lost to our view; although on the examination or analysis of Earths, the animals have never been discovered. Whale in some Basalt, &c. which was always supposed to belong to the vegetable kingdom. This specimen was found in a chalky rock at Saffron Walden. We have the spines from various places. Its great curiosity is, that the shell part is extremely perfect as a Carbonate of Lime, although filled up with Flint; which has scarcely disturbed it, notwithstanding its having overflowed as it were at both ends. This is said to be a variety of the Echinus Cidaris; to which we do not assent. R. Rashleigh, Esq.r has figured another species, Echinus coronatus, under similar circumstances; which not being uncommon, serves well to show that Nature performs the same offices by similar means in various places; & Rashleigh observes, its particular structure will point out to the Theorist that it is not the immediate effect of fire, in the common acceptation of that term, but with the aid of other principles modifying the operation so as to give another idea.



Echinifoirs Carbonate of Lime, with Flint running through it.

Tab. 8.

Cuprum oxygenizatum.
Filamentose Oxide of Copper.

Div. 2. Imitative.

Nature, ever various and instructive, often represents one thing with the appearance of another. Thus, a casual observer would expect that this Copper Ore merely consisted of filaments of scarlet silk: however, on examination with the help of a lens we with certainty distinguish the contrary, & see how beautifully Nature varies her operations, and under certain circumstances accomplishes the same end with different appearances: thus, the molecules are forming threads more or less discoverable in the shape of elongated octaedrons or cubes. The upper figure is decomposing Feldspar and Quartz with these filaments of ruby Copper Ore, some of which are in bent 4-sided threads crossing each other. Others are irregular and confused, apparently having been disturbed: see the left hand upper figure. In some parts they are disposed in straight filaments, crossing each other at right angles,

as I disposed it form a cube: see the right hand upper figure. The lower figure is chiefly Ruby Copper and Native Copper, with a little Quartz and copper Pyrites. The fibres on this are larger, and show signs of elongated octaëdrons and rectangular prisms. They are beautifully polished, with the full lustre of a Ruby. We may add that there is a regular gradation form the powdery oxide, naturally opaque, through masses of confused fi=laments so extremely fine as to partake of the same opacity, to such as resemble fine wool.

This specimen came Redruth in Cornwall.

Ruby Copper fibrous.

Tab. 9.

Calx carbonata, dura.

Hard Carbonate of Lime.

Class 2. Earths. Order 1. Homogeneous.
Gen. 3. Calx. Spec. 5. Carbonate of Lime.
Div. 1. Crystallized*
Syn. A new species of hard Carbonate of Lime. Bournon, Phil. Trans. 1803. 325.

* In arranging this variety, we should place it after all the other crystals.

This specimen came from Iceland it is very curious. We understand that only a few specimens have been preserved which were collected in the neighbourhood of Glasgow.

The structure at first sight has nothing new in it; but it might be taken for Carbonate of Lime, which it really is although the fracture much resembles that of Quartz, but is somewhat rougher. We admire the Count de Bournon's indefatigable patience in

measuring and pointing out the modifications of these crystals, which we did not attempt; we have only ventured to point out a few faces that were passed over, as they may possibly be interesting; for which reason we have made sketches of them. The bases seem exactly as the Count has determined them. The principal are 3 small ones on the summit, as represented fig. 2. — Fig. 4. Shows a minute triangular one, and one of those above mentioned. The matrix is ferriferous Carbonate of Lime with Pyrites and small double-pointed crystals of Quartz.
Flos-ferri and Aragon Spar of old authors belong to this variety.

Hard Calcareous Spar.

Tab. 10.

Calx carbonata, echiniformis.

Echinus-formed Carbonate of Lime.

Class 2. Earths. Order 1. Homogeneous.
Gen. 3. Lime. Spec. 5. Carbonate of Lime.
Div. 2. Imitative.

That animals are indebted to minerals is very evident although vegetables may be the instruments by which their nutriment is prepared. We may also say that great part of the mineral world is much indebted to the animal for its present appearance; for, under certain circumstances nature allows the animal construction to remain long after the animal itself. In this instance, it might have been a doubt whether a construction so complete as this Echinus and its spines could be an infiltration of Carbonate of Lime in place of the case, or rather bone, or the remains of the Carbonate of Lime which existed while the animal possessed it. Its fracture is sufficient to determine it to be Carbonate of Lime, without any other trial; and upon examination it is found to be nearly pure.

Mr. Hatchett, in his valuable account of the shells & bones of animals, proves the case of a recent Echinus to be bone, as it contains its due proportion of Phosphate of Lime. This is therefore the more curious, as there is no Phosphorus remaining to destroy the crystallized character; the carbonic acid predominating effectually in that particular. To know the animals that are thus formed as it were petrified may not seem at all the province of the mineralogist, nor is it perhaps strictly necessary; yet it is convenient to have such information, as it may be sometimes of great importance: and it must appear remarkable to all that although the petrified remains of other animals are very universal, yet those of our own shores are new found.* The shells are of a delicate structure. The animal parts, exclusive of the carbonate of Lime, must have been away, while Carbonate of Lime or Flint are filling up the vacancies.

This species of Echinus is either a new one, or a variety of Echinus Cidaris of Portlock Miscellany, came from Queenford - found in a chalky marle.

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* The British Museum has since the above was written been presented with a fine specimen of a Human Skeleton imbedded in Lime Stone - P. P.

Echiniform Carbonate of Lime.

Tab. 12.

Aurum nativum.

Native Gold.

Class 3. Metals. Order 1. Homogeneous.
Gen. 2. Gold. Spec. 1. Native.
Div. 3. Amorphous.

Gen. Char. Malleable, sonorous, reddish yellow, Spec. grav.
Spec. Char. Uncombined.

Syn. Native Gold. Kirw. 2. 93. Phil. Trans. 1796. p. 45.
Aurum Nativum. Walle, p. 2. p. 355.
Gediegen gold. Emmerl., p. 2. p. 111.
Or natif. Haüy 3. 374.
Aurum nativum. Linn. Syst. ed. 13.

Gold is well known to be found in Peru, several parts of the E. Indies, & Hungary, often crystallized in octaedrons and their modifications. It has been found in Scotland, in Cornwall and Ireland which Plan has long produced it: there have been found weighing from 3 oz to 22; but the mines have not yet been discovered. The upper specimen was bought of an Irishman in London; & this was one of his largest specimens. It is formed of flattish pieces, or laminated, as if it had been rolled up & beaten about very irregularly. It was cut in two at the

mint, which helped to discover this foliated appearance; and also, that it contained grains of whitish quartz and and ochraceous gritty clay (see the cut figure). A piece of soft brittle schistus, or slate, with a gray appearance on the inside was to be seen in it. The external colour is somewhat redder than where it is broken or cut. The third piece on the right hand was a piece of a redder; that on the left hand was the whitest of any seen in Ireland. The three lower pieces are different coloured specimens from Lammon Tin Stream, near Falmouth, Cornwall. Gold is much more scarce in Cornwall than in Ireland. The Irish specimen spoken of in Phil. Trans. was found to contain

Of Fine Gold	$21\frac{6}{8}$
Fine Silver . . .	$1\frac{7}{8}$
Alloy Copper & Iron .	$0\frac{3}{8}$
	24

Other specimens differ a little; and thus, if we may judge by the outer aspect, the reddest probably, contains most copper & iron, & the whitest most silver. More silver seems to give a greenish tinge to gold: the little lowest left-hand figure has that tinge.

Gold, Irish and Cornish.

Tab. 13.

Calx carbonata fœtida.

Coraceous Steinkstein.

Dio. 2. Imitative

The formation of this substance, however singular, seems hitherto to have escaped notice. It might perhaps at first be taken for a Coralline; but we have by comparison of specimens convinced ourselves that it is rather an assemblage of funnel-shaped Stalactites formed in a fluid medium, the surface of which has become encrusted at regular intervals, especially around the Stalactite. Although there is a variety of specimens, yet the structure coincides very accurately in many of them. Some indeed are more puzzling to account for than the present. It not uncommonly happens that Stalactites are hollow, (see tab. 57.) and others conchiliated. They also evidently form a deposit, or case after case, on the

outside in a concentric manner. This does not seem to have been formed so; the peculiar state of the substance of which it appears to have been composed, having only a certain quantity of moisture, enough to form a kind of paste, which may have allowed it to have dropped into one mass at more or less regular periods, producing this remarkable appearance. Now it happens that the spot which produces a variety of these produces also the Botryoidal Nitrostein in great abundance & variety. See tab. 80. They are generally found filled with a chusty ochraceous marle, such as would readily allow scattered drops of water to collect it on their surface. This came from near Sunderland.

Ochraceous Steinkstein.

Tab. 14.

Cuprum oxygenizatum.

Crystallized Red Oxide of Copper.

Dic. 1. Crystallized.

This is from Cornwall and a curious specimen, it has a remarkable modification – the cubo-octaedron of Haüy, with the addition of a obtuse 4-sided pyramid on each cubic face, formed as it were of somewhat distinct plates. ~~It~~ In one crystal this pyramid is formed into a cross, the plates of which it is composed being notched or incomplete in the centre of their edges, and complete at the corners: see the right hand upper figure. With these are crystals of similar forms, of very pure copper, composed of oblong particles with a reticulated appearance as if they were some of the others, of an anterior formation having been deprived of their oxygen. These crystals are very extraordinary, as they comprehend the

Octaëdron with truncated edges: they have also truncated and levelled solid angles, making a very compound crystal: see the left hand figure. The intermediate varieties are the dodecaëdron, truncated at the solid angles. The particles show some signs of being thread-like confused octaëdrons, somewhat resembling those in plate. tab 8. They are externally between a copper colour & red, scarcely metallic in the lustre, until cut, & then perfectly so. It is as the Count Bournon observes, useful in many instances to use a magnifier to examine the crystals; & we should lose many interesting beauties without it. These indeed may be pretty well seen by the eye alone, but it is admirable to observe how neatly these are formed by such help as the magnifying glass. We do not know of any other specimen of this kind.

Ruby Copper.

Tab. 15.

Argilla marga.

Argillaceous Marle.

Class 2. Earths. Order 2. Compound.
Gen. 1. Argilla. Spec. 1. Marle.

Div. 1. Irregular.

Syn. Sophus turbinatus. Linn. Syst. Nat. ed. 13. v. 3. 190.

We so frequently find the figure of corallines, or other organized substances, that we are often puzzled to account for them; some however are readily understood to be infiltrations taking place of them, and that before us has hitherto been considered by many in this light. The singular regularity of the specimen here figured has given rise to many conjectures. Lowerly Whitton with Linn. that it is a Stalactite formed under certain circumstances among other

operations of nature, which may be continued to a great extent. Thus Mr. Martyn observes that a very large space in Derbyshire is of this formation. It is finely crenelated: and in other respects the cones run into each other, something like a Chelas horn gig - which will separate into a number of cones, more or less perfect, if placed by the fire. From the present specimen Sowy. separated some cones, by alternately wetting and drying it. We do not know how minutely they may be divided. The fracture is like other compact calcareous marles, that are not governed by the conical formation. This specimen came from Boulby in Yorkshire alum-works, & was remarked for being like a horses hoof, having settled upon a horne Ammonis. They are mostly of an argillaceous marle: but Sowy. has one from Cumberland, from Barton Fell, which seems to be more of an Iron Ore than any of the others. In most of the English specimens the cones are rather confusedly coalesced. In foreign ones, groups of cones joined together by their edges are apt to step separate. In this there are so much pyrites that it might be used as an alum ore.

Argillaceous Marle.

Tab. 16.

This is a variety of Sulphate of Lime from Bedfordshire, showing a tendency of the lamina to separate and bend which they will generally do in the longitudinal direction. Thus a plate of Gypsum will be found to break less readily in this direction, always bending before it breaks, & then generally raggedly, In the other direction, it is either glassy or foliaceous. When these crystallizations spread like the tower figures they are commonly called Lions paws. Crystallized selenites are the Moon Stones of Gesner and Agricola. See Plots Oxfordshire p. 81.

Crystallized Sulphate of Lime or Gypsum a variety.

Tab. 17.

Ferrum argillaceum.

Argillaceous Oxide of Iron.

This specimen came from the banks of the river Tees, which place seems to abound with many curious petrifactions. It appears to be a fragment of a large flat piece of a conformed Iron Stone, a good one of the kind. It is however rendered additionally curious, as it includes Carbonate of Lime, or Calcareous Spar, in the form of Echinus spines, but different from any before mentioned.

Iron Stone including Echinus Spines.

Durham.

78

Tab. 18.

74 Ferrum sulphureum, decomponens.

Sulphuret of Iron, decomposing.

Class 2. Metals.	Ord. 1. Homogeneous.
Gen. 7. Iron.	Spec. 4. Sulphuret of Iron.

Sulphuret of Iron, or Iron Pyrites, under certain changes of atmosphere, forms sulphate of Iron, or Green Vitriol, and often falls to pieces with efflorescence; to prevent which, and to preserve curious specimens, they must be kept immersed in water. The upper specimen was sufficiently protected by the dark partly crystallized, outward, ~~outward~~ coat, from decomposing in the common atmosphere of a room, in a damp ~~room~~ neighbourhood; But soon after it was broken, the more porous parts put forth curls of light-ish-green vitriol, and at the edges chiefly, sulphur: It still slowly decomposes and has continued to do so for some months; in time perhaps it may fall to pieces, or remain a porous iron ochre, like the lower figure. These specimens were found among a micaceous limestone in a quarry near Godstone, in Surrey, where they roll down from the top in great abundance.

Sulphuret of Iron, or Iron Pyrites in a decomposing State. Godstone.

Tab. 19.

Ferrum argillaceum.

Argillaceous Oxide of Iron.

This is nearly the same as that figured in the last plate; but it has pebbles and gravel about it, which are cemented with it into a hollow box-like form. It was discovered by an endeavour to break the stone from off the top of the upper figure, and thus formed a lid to the box. The lower figure is curiously concentrated with light ochre and a darker umber, and serves to give an idea of the formation of some pebbles, particularly of the nature of those called Egyptian pebbles, (not the most admired sort,) of which more is said.

Irony Geods.

Tab. 20.

Ferrum nativum.*

Meteoric Iron.

Class 3. Metals. Order 1. Homogeneous.
Gen. 7. Iron. Spec. 1. Native Iron.

Spec. Char. Malleable, and nearly uncombined.

Syn. Ferrum retractorium, granulis nitentibus, matrici viridescenti immatis, (Ferrum viridens Linn.) cujus fragmenta, ab unius ad viginti usque librarum pondus, cortice nigro scoriaceo circumdata, ad planum, prope Tabor, circuli Bechinensis Bohemiæ passim reperiuntur. Lithoph. Born. pars 1. 125.

Stones said to have fallen from the Clouds. E. King's Remarks on, &c. 21.

Certain Stony and Metalline Substances which have fallen from the Atmosphere. Phil. Trans. 1802. part 1. 174. 183.

* This is arranged as a native iron, which is its great characteristic ingredient. It must come near the Iron of Siberia, Bohemia, &c. and be followed by the suboxides.

To introduce a subject, however curious, as having fallen like a meteor from the Skies, might seem absurd in a work on British Mineralogy. But whatever may be the extent of this term mineralogy, it is pretty universally understood to include a knowledge of stones and metals; among the latter of which we place this production, and feel much gratified in adding so great a rarity to the British catalogue.

But we ought in charity, to wish such may still continue to be rare, as otherwise the consequences might be dreadful. It is particularly to be noted that the same substances are only found under similar circumstances. Many of these stones have fallen abroad in different places, but only two are known to have fallen in Great Britain; The first in Yorkshire, part of which is here figured; and the other in Scotland. They have been found to contain

1. Silex.
2. Iron in a malleable state.
3. Magnesia.
4. Marshal Pyrites.
5. Nickel.

The Silica is leden gray, in some parts rather vitreous, with rectangular yellowish fragments: – see the left hand figure. It is in very numerous but minute particles, which require the aid of a magnifier to be distinguished. – The Iron is grey, much dispersed in particles of different sizes, mostly very small, often in rows, and sometimes in veins. – The magnesia seems combined with the silica, and the Nickel chiefly with the Iron. – The Pyrites are ~~chiefly~~ dispersed in particles among the whole, some enclosing malleable iron, and some looking, when magnified, like particles of quicksilver; others are more distinct, and tarnished like common pyrites. They emit a blue blaze if projected on red hot charcoal, and are easily fusible, becoming magnetic. The coating seems to be fused together, is very thin, and somewhat less magnetic than the rest; in some parts entering and forming veins within the stone. The whole is in texture like a compact sandstone, and may be crumbled into little pieces by the nail. The fracture is irregularly conchoidal, sandy or earthy. There are dispersed through the whole several spherules of a laminated texture, which were first observed by Mr. Howard.

The upper figure is a fragment showing the coat and the indentations common to most of these stones also the little reticulated cracks sometimes filled up with the whiter parts of the stone.

The right hand middle figure shows the other side of the same fragment, with a vein of Iron, somewhat raised, since being broken; also little knots of iron, of a metallic lustre, which are irregularly scattered among the more minute particles of the same, with pyrites in the mass of the whitish earthy substance, composed of silex and magnesia. The left hand figure shows the vitreous substance found in some parts of the stone, highly magnified. Count Bournon has found the same in the Sienna one. It is to be scratched with the nail, else we should have compared it with the peridot of Bournon, or chrysolite of Werner, which is found in the Siberian iron. It is remarkable, that besides this substance Sowerby has some crystallized pyrites adhering to a piece of Siberian iron. The lower right hand fragment is magnified. It shows the granular formation of the stone, with somewhat tarnished pyrites, and the particles of Iron in circular rows. The two bottom left hand figures represent the earthy spherules. (These agree partly with those found by the Count Bournon in the Bohemian Stone)

The following account of the Yorkshire Stone was communicated by Major Topham: (Sowerby has the stone in his possession) "What projectile force could throw a stone of 56 pounds weight from any volcano upon earth to the spot near my house where it fell? Whether it might not come from some volcano in the Moon? an idea to which French Scavans much incline: or whether a flash of lightning striking into the ground might not have power to conglomerate, to form at once, and, as it were, to knead together that heterogeneous mass of sulphureous and mineral matter of which this stone, and all others that are supposed to have so fallen seem to be composed? It was on Sunday, about 3 O'Clock the 30th of December, 1795 that this stone fell about two fea-fields from my house. The weather was misty, & at times inclining to rain; and though there was some thunder and

lightning at a distance, it was not till the falling of the stone that the explosion took place, which alarmed the surrounding country. When the stone fell a shepherd of mine was about 150 yds. from the spot; Q. Sowden, was passing within 60 yds. & John Shipley was so near the spot when it fell, that he was struck forcibly with the mud &c. raised by the stone dashing into the earth which it did to the depth of 12 inches, & 7 afterwards into the chalk rock, making in all 19 in.s from the surface. While the stone was passing through the air - which it did in a N. E. direc.n from the sea - numbers of persons saw a body passing through the clouds, but could not ascertain what; many of the provincial newspapers published accounts. The stone is totally different to the nat.l stones of the country: in its fall it excavated a place before mentioned. something more than a yard ~~circum.~~ diam.r & so strongly it fixed itself into the chalk rock that it cost some trouble to remove it. To perpetuate the spot where the stone fell I have erected a pillar, with a plantation round it, & this inscrip.n:

Here
On this Spot
Dec.r 13th 1795, fell from the Atmosphere
An extraordinary Stone!
In Breadth 28 inches,
In Length 30 Inches,
and
Whose weight was 56 Pounds!
This Column
In memory of it was erected by
Edward Topham
1799.

Compared to the one which fell in Scotland it appears similar, though the pyritaceous particles perhaps somewhat less conspicuous. This Stone was seen to fall into a small drain of Water at Pepil Quarry by 2 men 2 boys & a dog (The dog ran home as if frightened, the noise was heard by many people at different places, within 20 miles, and 30 feet under ground in the Quarry) April 5th 1804. Among these was the overseer of the quarry, who was talking to a man in a tree at the time. a noise was heard, for about 2 minutes, beginning in the W. & passing by the S. round to the E., with as much noise at first as if 3 or 4 cannon had been fired near the

bridge, which conducts the canal of Clyde & Forth over the river Kelvin, a mile & ½ westward of the quarry; afterwards a violent rushing whizzing noise was heard. Sir J. Banks first observed the similarity of these substances to one another when he went to see the York.r one exhibited in Piccadilly, and compared it with a fragment he had got from Benares; he had a very perfect one from L'Aigle; it was nearly black all over. The Siothorne seems a little rusty in the outer coat. The Stone which fell Dec.r 13th 1803, in Bavaria, on a cottage, it happened on the very day the York.r one fell; it is said the pyrites are cubical. Thus Ring "Tradition has handed down to us the fall of stones in antient times. The learned Gravius leads us to conclude the image of Diana was a stone which fell from Heaven. Herodianus says the Phoenicians had no statue of the Sun but a great stone which they reported to have fallen from Hea.n Plutarch also mentions them. Livy &c. Their form angular. We now give the analysis from the ingenious account by S. Howard, Esq.r in Phil. Trans. 1802, part i. page 168 & following

Of the Stone which fell in Portugal, by the Royal French Academicians,

Sulphur	8½
Iron	36
Vitrifiable earth	55½
	100

Stone of Ensisheim, by Mons. Barthold, gave in 100 gr.

Sulphur	2
Iron	20
Magnesia	14
Alumina	17
Lime	2
Silica	42
	97

Stone from Benares, the outside coating of which was found by Mr. Howard to contain iron and nickel. The pyritaceous part in grains contained

Sulphur	2
Iron	10½
Nickel	1
Earthy matter	2
	15½

The globular particles in 100 gr. contained,

Silica	50
Magnesia	16
Oxide of Iron	34
Oxide of Nickel	2½
	101½

The earthy cement in 100 gr. contained,

Silica	~~40~~ 48
Magnesia	18
Oxide of Iron	34
Oxide of Nickel	2½
	102½

150 gr. of the Siena Stone.

Earthy part

Silica	70
Magnesia	34
Oxide of Iron	52
Oxide of nickel	3
	159

In the metallic part,

Iron	6
Nickel	2

150 grains of earthy part of the Yorks Stone,

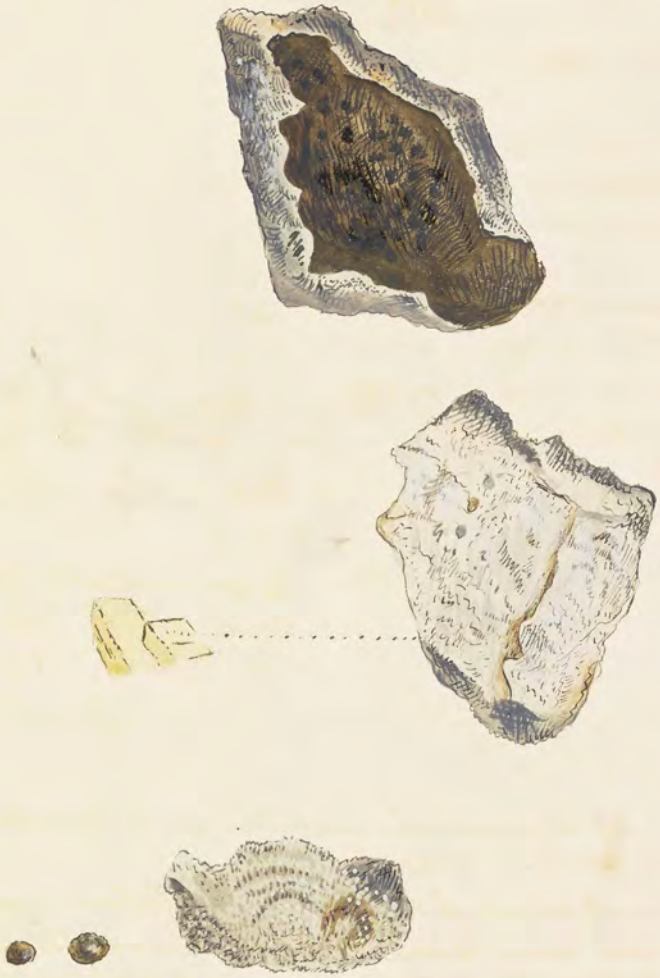
Silica	75
Magnesia	37
Oxide of Iron	48
Oxide of nickel	2
	162*

14 gr. malleable part.

Oxide of iron	17½
Nickel	1½

* When there is an overplus, it is from the metallic parts absorbing the oxygen from the acids in the progress of analysation.

The exact weight of the stone which fell, by Merlins balance was 8 stone 13 lbs; when taken up it was warm & smoked. a man saw it coming down at the distance of about 10 yds from the ground; and as it fell a number of explosions were heard loud as a pistol. at Bridlington, & at different villages, sounds were heard in the air The following people witnessed the circumstance Mr. Wm. Wilson fell within 200 yds of him. a man servant of Mr. Wm. Poole, who lives near Capt. Topham. Charles Preston, son of Revd. Mr. Preston - many hand bills were given about at the time attested by the most respectable men of the place who were eye witnesses of it - vide Sowerby's British Mineralogy: The whole account [illegible] leave taken up too much room for this copy of the work —



Fragments of the Stone which fell from the Atmosphere in Yorkshire

Tab. 22.

Quartzum calcareum: Var. decomponens.

Decomposing calcareous Pudding-stone.

Class 2. Earths Order 3. Aggregate.
Gen. 1. Quartzum. Spec. Calcareum.

Gen. Char. Quartz aggregated by the help of some cement.
Spec. Char. By the help of carbonate of lime.

It often happens that siliceous aggregates decompose; especially when their cement is calcareous; which is the case with the present specimen. It is perhaps now first spoken of, and gives us reason to suppose that the iron or colouring matter is disengaged from the calcareous cement by some agent capable of penetrating the inmost recesses of the stone. This cement filled the cavities of the mass, leaving them hollow, or with the porous remains of the pebbles only filling a part of the old cavity. Some think the stones are only forming not decom.d but the cavities appear to have been filled by a whole stone. Some of the stones are whole & may be scratched with the nail. Some hard as flint. Some are wholly Carbonate of Lime. Some silex, others partly iron. a Specimen of the 2d was found in Richmond park at the depth of 365 feet. This is a piece of rock chiefly quartz and carbonate of lime inclining to be somewhat spongy and reddish with oxide of Iron: Some of the cavities are empty, others the remains of pebbles in them. Some nearly whole. The lower figure looks like a common pebble, the colouring part of which has suffered oxidation so as to become a loose ferruginous ochre. Some of the best mill stones are of this nature on a larger scale, the quartz being left very porous; & these are preferred for grinding corn.

Decomposing Pudding Stone,

Warwickshire.

Tab. 23.

Ferrum sulphureum.

Sulphuret of Iron. Iron Pyrites.

Class 3. Metals. Order 1. Homogeneous.
Gen. 7. Iron. Spec. 4. Sulphuret of.
Div. 2. Imitative.

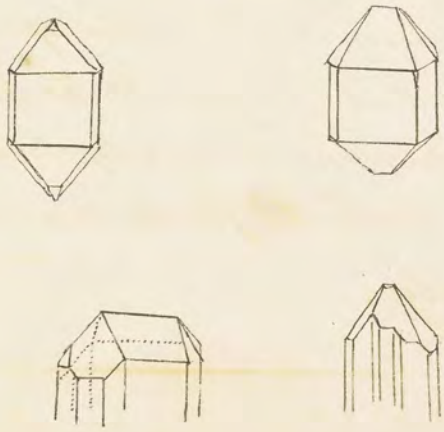
Syn. Sulphuret of Iron of particular Shapes. Bab. 204.

Sulphur and Iron in combination are very common, and the forms of such compounds are extremely various, both in regular crystallization and in the rudder states. The upper figure resembles such as have been in chalk with an ochraceous outside. resembles the fruit of the Platanus Orientalis: the surface, is crystallized, in quadrangular pyramids, or half relieved octaëdrons, with or without fumcations. This proves it to be a natural form to itself & not the fruit of the Platanus. The forms of the crystallization are magnified beneath, to show how curiously they connive, sometimes giving a floriform appearance. The next was found among the nearby rocks at Sheppey Island, & seems to have been like Beads, dropping at intervals, & giving this singular formation of an inverted cone. The next figure, resembling a Mushroom-button, seems formed in a similar way; The crystallization & metallic appearance help to undeceive. However, this is not always the case; & even this might from its rugosity, like the shaggyness of a Mushroom or cup of an acorn, mislead those who do not pay regard to the crystallization of natural to Pyrites. The cracks resembling stripes in the left-hand figure like a Mushroom help to favor the deception. certainly Mushrooms grow plentifully on Sheppey Isle; this may have given rise to the idea of this being petrified, though any lofty fungaceous Fungus might have stood a better chance. This sort of Pyrites is very common in argillaceous marl all over the kingdom and it varies infinately.

Sulphuret of Iron, or Iron Pyrites
in the form of Mushrooms &c.

Tab. 24.

The specimen here represented would, very naturally, be taken for one of quartz, which it much resembles; and perhaps it might be passed over by casual observation as such. It came from the Lead hills near Glasgow and is very valuable. It is figured of the natural size, and has a part of a large hexaëdral column very distinct, with many 18 sided crystals, either like the ~~outside~~ outline in the middle at the right hand, or like the lower figure at the right hand, with the column interrupted as it were in its formation, giving them the appearance of the buttresses often used in Gothic architecture, and adding many faces to the sides of the crystal, as well as giving additional angles to the faces of the pyramid. They vary much; one is nearly like the left hand bottom figure with 13 faces, having a pyramid at one end only.



Dodecaëdral crystallized Carbonate of Lead. with Columns

Tab. 25.*

Silex Quartzum; var.

Quartz, or Agate

Class 2. Earths. Ord. 1. Homogeneous.

Gen. 4. Silex. Spec. 1 Quartzum.

Div. 2. Imitative.

The river Tay in Perthshire, as well as other parts of Scotland, affords many beautiful pebbles. The upper one has been cut for ornament. The lower specimen came from the Tay. These pebbles appear to be formed in the rocks in short stalactites forming in coats, which being more or less coloured by Oxide of Iron, form stripes or circles, &c.; the outside rather knobby. This the lapidaries have taken advantage of, as is seen in these pebbles, and it assists in the disposition of the colours. Much seems to depend upon Quartz, Alumine and Iron to increase the beauties of this Stone, forming in it Jasper, Agate, Cornelian, &c., so arranged in one Stone as to give it variety and beauty. {the red circles are often specks of red in transparent Quartz.} The parts with greenish specks, which are magnified at the bottom, are more porous than the rest, apparently filled with Chlorite.

Agate – Scotch Pebble.

Tab. 25.

Cuprum carbonatum.

Crystallized Green Carbonate of Copper.

No. 1. Crystallized.

This came from nearly the same spot as the blue, and is equally rare. The crystals are nearly the same, or differ in being thicker, and having truncations. These crystals were sent loose so easily could be ~~analysed~~ determined. We therefore without analysis, consider these crystals as the same with what we have less perfectly crystallized from other places as Wales, &c.

Crystallized Green Carbonate of Copper.

Tab. 26.

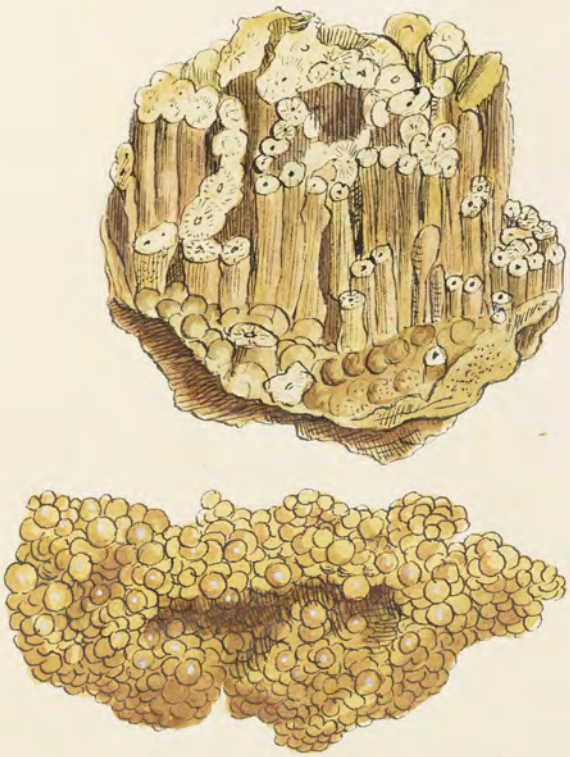
Zincum oxygenatum.

Stalactitical Oxide of Zinc, or Calamine.

Dic. 2. Imitative.

Syn. Zinc oxidé concrétionné. Haüy, 4. 162.

Calamine, or Oxide of Zinc, is here truly imitative. In the present instance it much resembles Flos-Ferri, Flos-Ferri is well known from the Styria Iron mines, and is mostly of a fine white, and coralliform shape like tab. 60. but with a surface finely covered with minute spicutated crystals, giving it a soft downy appearance. some moderate specimens from Scotland we have, which, however is generally more varied in its form. This is a rare specimen. comes from Wanlockhead mine, in Scotland.



Oxide of Zinc in appearance like Flos-ferri.

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Tab. 27.

Plumbum carbonatum.

Straw-like Carbonate of Lead.

Div. 2. Imitative.

Syn. Plomb carbonaté aciculaire. Haüy. 3. 483.

Carbonate of Lead in Spicula is found in some parts of Cornwall, Devon. Somerset. the county of Durham &c. This specimen is an irregular bundle of fibrous crystals, many of them nearly tubular, curiously formed among ochre, which gives it an odd appearance. The spicula are chiefly formed into irregular columns, something like short pieces of straw. It is upon an Argillaceous Iron Stone with thin veins of Quartz. Mr. Laing, has a specimen with similar crystals 7 inches in length 5 in breadth, 4 in thickness. The crystals are in similar groups, but cemented by amorphous Carbonate of Lead. The entire specimen is of a pure milky white colour. Large as this specimen is, the crystals are not greater than in the one figured.

Straw-like Carbonate of Lead.

Tab. 28.

Zincum oxygenizatum.

Crystallized Oxide of Zinc.

Class 3. Metals. Order 1. Homogeneous.
Gen. 6. Zincum. Spec. 1. Oxygenizatum.

Gen. Char. Light gray, ductile, brittle. Fracture foliated, brilliant; easily fusible, burning with a green flame and soluble in acids.

Spec. Char. Zinc in combination with Oxygen.

Syn. Zinc, mineralized by Oxygen. Kirw. 2. 233.
Galmei. Emmerl. 2. 454.
Zinc oxyde. Haüy, 4. 159.
Calamine, ou Pierre Calaminaire. De Lisle, 3. 79.

Having figured Blende or Sulphuret of Zinc, tab. 196. & 167 we are glad to add perfect crystals of Oxide of Zinc. It is the only specimen that has been noticed; it consists of beautiful topaz-coloured crystals dispersed about the specimen some of which are too small to be seen without the help of a lens: others may be seen without one, three in particular as figured. Hitherto crystals of Oxide of Zinc have been but little noticed in great Britain. Mr. Smithson in Phil. Trans. for the year 1803, part i. 17. after speaking of a

yellowish Calamine from Derbyshire not electric, says of electric Calamine — " that the Abbé Haüy has considered this mineral as differing from the other Calamines only in the circumstance of being in distinct crystals; but it has already appeared, in the instance of the Derbyshire Calamine, that all the crystals are not electric by heat, and hence that it is not merely to its being in this state that this species owes the above quality. And the following experiments on some crystals of electric Calamine from Rechania in Hungary, can leave no doubt of its being a combination of Calx of Zinc with Quartz, since the quantity of Quartz obtained, and the perfect regularity and transparency of these crystals, make it impossible to suppose it a foreign admixture of them. They were not scratched by a pin; a knife marked them." According to Pelletier's experiments on the Calamine of Fribourg in Brisgau, which is undoubtedly of this species, its composition is;

Quartz	0·50
Calx of Zinc	0·38
Water	0·12
	1·00

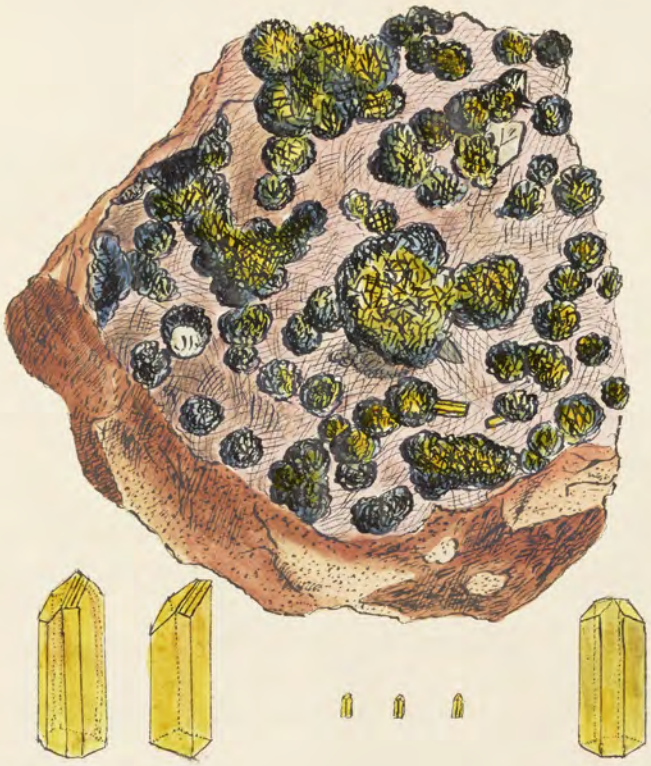
And according to his own experiments;

Quartz	0·250
Calx of Zinc . . .	0·683
Water	0·044
Loss	0·023
	1·000

"The water, he observes, is most probably not essential; and in that case, from his experiments, it would be:

Zaratz	0·261
Oxide of Zinc .	0·739
	1·000

"He also says he has found this species of Calamine among the productions of Derbyshire in small brown crystals, &c.; & their form seems, as far as minuteness and compression together will allow of judging, nearly or quite the same as those of Bugbania; and the least atom of them on being heated immediately evinces their nature by the strong electricity it acquires. On their solution in acids they leave Zaratz." When we first looked at this specimen we did not know what it was; but on trial with the blowpipe, as it fused into flocculi and dissipated, we soon determined it; there are some additional facts not mentioned in Haüy, which, although very minute, were sharp enough to be discerned. It is curious to see a small portion gently warmed, how readily it attracts small scrapings of paper. These little elegant crystals stand on a gangue of Red Sulphate of Baryte crystallized on the surface in little plates of a pinkish colour, modified like tab. 160. bottom figure. We also find, on the surface, Sulphuret of Zinc and Sulphuret of Copper in somewhat irregular groups of crystals; the first of a gray colour, the latter of a golden hue, and almost in tetraëdrons. There are some nearly metastatic crystals of carbonate of Lime, and a few crystals of Galena.



Crystallized Oxide of Zinc.

Tab. 29.

Zincum oxygenatum.

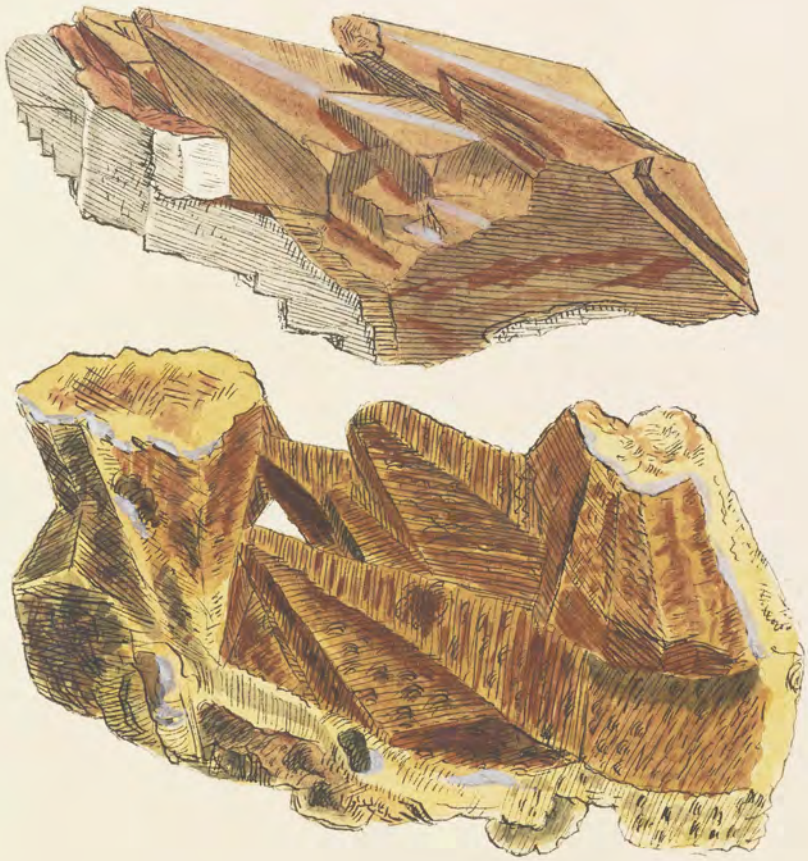
Oxide of Zinc, or Calamine.

Class 3. Metals. Order 1. Homogeneous.
Gen. 6. Zincum. Spec. 1. Oxygenatum.
Div. 2. Imitative.

Oxide of Zinc, tab. , was crystallized in a shape peculiar to itself. ~~It~~ In the present instance it occurs in the form of another substance, viz. Carbonate of Lime: see tab. . It is not a little remarkable that this oxide should thus take the place of another substance, and assume its form, so as to become what is termed secondary crystals {When any mineral takes the place of a crystal, either by decomposing it or taking the cast of the mould first formed by another, it is called secondary, as it is so to those formed originally by the first substance. Calamine sometimes replaces Lead Spar, &c.} They are so frequent in Oxide of Zinc as often to prove a very convenient help towards discriminating that substance, otherwise not easily characterized, from the earthy appearance it commonly assumes. It is found in Flintshire Derbyshire, and Mendip in Somersetshire &c. In these shapes

mostly taking the form of Carbonate of Lime, and is often detected in the process shewn in the upper figure. The upper surface is a smoothish Oxide of Zinc, and beneath still remains crystallized Carbonate of Lime. In the lower figure the Oxide of Zinc has supplanted the Carbonate of Lime, and is cellular or porous, which is one of its characters where it is often called bony, from the resemblance to the cellular inner part of a bone. It is sometimes white but mostly coloured by Oxide of Iron, with various ochreys tints, and seldom has any lustre. It is procured in large quantities for the manufacture of Brass &c. and produces about 30 per cent Zinc.

Zinc has been found perfectly ductile if heated to a certain temperature.



Oxide of Zinc, or Calamine, having taken the metastatic form of Carbonate of Lime.

Tab. 30.

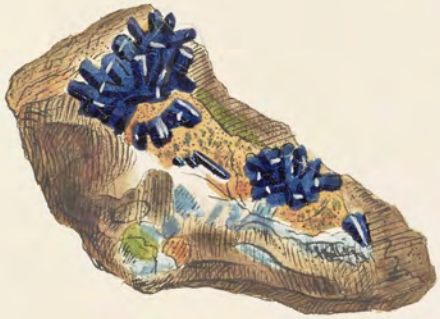
Cuprum carbonatum.

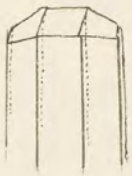
Crystallized Blue Carbonate of Copper.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 10. Cuprum. Spec. 5. Carbonatum.
Div. 1. Crystallized.

Syn. Cuivre oxidé bleu. De Born, 2. 329.
Azure de Cuivre. De Lisle, 3. 324.
Kupfer lazur. Emmerl. 2. 246.
Blue calciform Copper Ore. Kirw. 2. 129.
Cuivre carbonaté bleu. Haüy, 3. 562.

Blue Carbonate of Copper has rarely been seen crystallized, especially in the present form, & has not before been mentioned as a native of any part of G.t Brit. This specimen is in the cabinet of G. Laing Esq.r and comes from Wanlock head mines; Sow.y has some fine specimens of this mineral from Cornwall.





Crystallized Blue Carbonate of Copper.

Tab. 31.

Silex Quartzum; var. Jaspis.

Quartz-Jasper.

Class 2. Earths. Ord. 1. Homogeneous.
Gen. 4. Silex. Spec. 1. Pure.
Div. 3. Amorphous.

Syn. Quartz-Jaspe. Haüy, 2. 435.
Gemeiner Jaspis. Emmerl. 1. 243.
Jasper. Kirw. 1. 209

Some Jasper has the appearance of a Ribband, and is called ribband or Band Jasper. Either term is intelligible, and may answer the purpose well enough as to this part of the character, although it may with more propriety be called Stratified. Jasper is nearly allied to flint approaching hornstone, having rather a horny appearance. It is an impure amorphous Quartz, somewhat altered by a mixture of Argilla. Oriental Jasper is said to contain

Silica	60·75
Argilla	27·25
Magnesia	3·00
Oxide of Iron . .	2·50
Potash	3·66
	95·216

Its fracture is smooth, conchoidal or splintery, very little translucent at the edges. It is rather tougher but scarcely harder than flint. It occurs in many varieties, and it is often marked with darker and lighter stripes, but seldom very bright. Dull green is perhaps most frequent. The present figure exhibits a very distinct neatly striped vein in front of a variegated rock composed of Quartz, &c., and there are small threads or little veins passing irregularly from it. It was picked up on the coast of Ayrshire, and is in Mr Laing of Edinburgh's collection. Sowerby has large masses of Jasper striped or coloured nearly in the same way, from the shores of Scotland. Jasper was formerly much used for large vases, &c., as it takes a good polish.

Striped Jasper.

Tab. 32.

Silex magnesiatus; var. amianthiformis.
Wood-like Amianthus, or Asbestus.

Div. 2. Imitative.

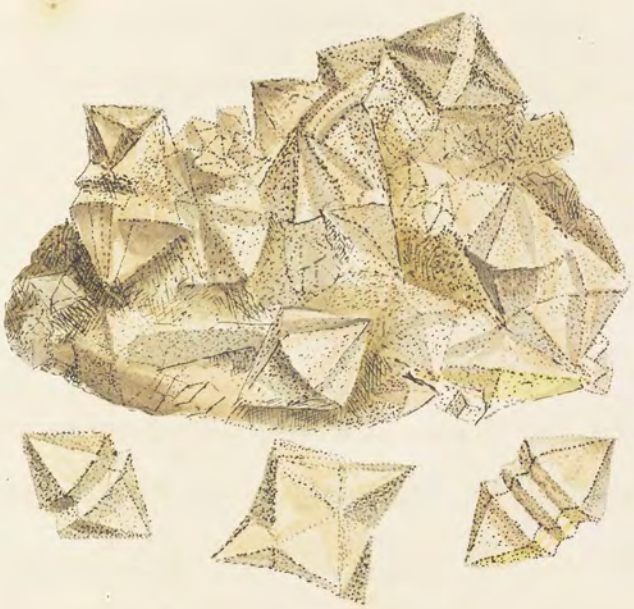
This is formed in upright and often curved filaments, sometimes in masses or plates. It is often indurated in a high degree, & resembles wood petrified. See the lower figure. The present kind is found at Portsoy in Scotland in abundance, crossing in many directions through the Serpentine rocks. The upper specimen was given Sowerby by L^d. Seaforth. It is somewhat undulated, & varies in colour, is harder in some parts than others. Some may be separated into flocculi with the nail. Some will bear a good polish; when it is brittle like Actinolite. The lower fig. came from Portsoy, & is remarkable for filling a narrow flaw in the Serpentine in a very thin plate, & showing fractures transverse to the strie at nearly right angles. hard enough to take a good polish hard as common marble. This & many earthy ~~subjects~~ stones resemble Wood especially the undulating Slaty rhombiform rocks.

Wood-like Asbestos.

Tab. 33.

Barytes carbonata
Carbonate of Barytes

This specimen came from Mr. Hall's Lead mines in Arkendale, Yorks. curious as the crystallization is a most perfect dodecaedral Quartz, with the 2 Hexaedral pyramids meeting at their mutual base without any intermediate prism - you in Quartz! On further examination we find a modification peculiar to itself and which has never been seen in Quartz &c. before. See the Right and left hand figures. It is so new in its nature that an expression is wanted for it, it cannot be termed marbled, but rather articulated or jointed. These figures have one or two joints, lengthening the crystal ways without a tendency to continuing at the mutual bases or falling up the interruption so as to form the plane of the column; the vacancy is contrary to those of Carbonate of Lead, which it somewhat resembles in the first instance: See tab. 3. 24. 44 & may be of much utility for external discrimination. The Carbonate of Barytes here, has a tendency to crystallize in groups, in a stellated manner: see mid. figure. The whole of the Carbonate of Barytes is chiefly found on Carbonate of Lime, & is partly covered with Sulphate of Barytes in fine specula. Some of the carbonate of Lime is in Garnet dodecaedrons with short columns, an uncommon form for carbonate of Lime: See tab. 105. right hand outline



Carbonate of Baryte; Varities of.

Tab. 34.

This specimen is part of a large aggregated mass {Schorl is said to be mostly aggregated, and Tourmaline to be chiefly imbedded in single crystals} that came from Cornwall, and is composed of numerous crystals forming several distinct varieties, where they are not confusedly intermixed with each other. It seems to have been found in the vicinity of a red Oxide of Iron, as the colour about it indicates. In Mr. Syneger's account of the analysis {Nicholson's Journal, vol. 4. 812}, it appears that it contains oxide of Titanium. It is somewhat remarkable that the red Schorl of Siberia, and the large specimen of Indicolite or Titanite {This was presented to Col. Symes by the King of Ava, and said to be worth £1000} (as it has been called) in the possession of the Ht. Hon.ble C. Greville, are by some considered as varieties of Tourmaline. The Crystals of this specimen show many of the faces which are generally found on the Tourmaline; viz. the 3 sided prism truncated at the edges & formed into a 6-sided prism.

The same with two or more bevellings on the edges &c. The fracture is somewhat conchoidal, & the primitive form is a rhomboidal parallelopiped. Tourmaline is harder than Quartz. With moderate heat it becomes electric attracting and repelling ashes, &c. {Foreign specimens, sometimes cut and polished, are known by this property} a property said to be in Schorl, Bergm. 2. 124. Kirw. 1. 272. The latter observes that Bergman thought Lime essential to Schorl in the Analysis of that of Mount Mann which Mr. Kirw. says was probably Hornblende.

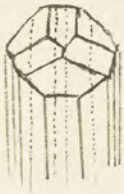
Mr. Kirw. asserts that Schorl was named so from its brittleness; others say from the Valley Schorlow where it was first noticed

Analysis of Tourmalines by Bergman.

	Of Tyrol.	Of Ceylon.	Of Brazil.
Argill	42	39	50
Silex	40	37	34
Calcareous Earth	12	15	11
Iron	6	9	5
	100	100	100

Analysis of Tourmalines of Brazil by Vauquelin.

Silex	40·00
Alumine	39·00
Lime	3·84
Oxide of Iron	12·50
Oxide of Manganese	2·00
Water	2·66
	100·00



Another variety of Tourmaline.

Tab. 35.

Silex Petuntse.

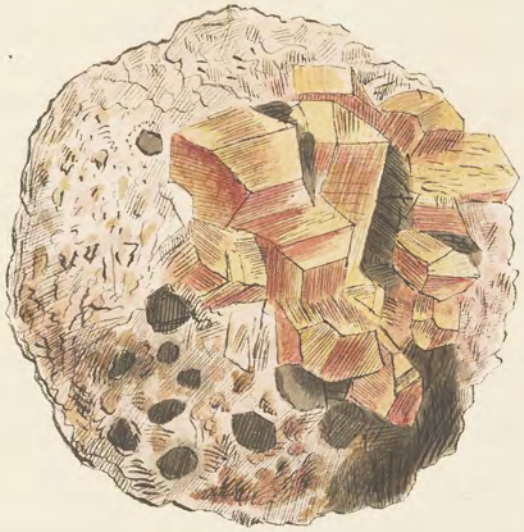
Feldspar and Petuntse.

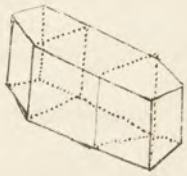
Class 2. Earths. Order 1 Homogeneous.
Gen. 4. Silex. Spec. Petuntse.
Div. 1. Crystallized.

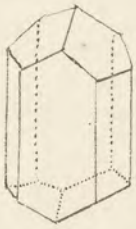
Syn. Feldspath. Delisle, 2. 445. Emmerl. 1. 226.
Feldspar. Kirw. 317.
Feldspath. Haüy, 2. 590.
Spatum campestre. Linn.

Feldspar is a very common substance, chiefly found in aggregates of various descriptions. in granites that come from Aberdeenshire to pave the principal highways in the metropolis, and remarkable in the Moor Stone of Devonshire on London and Westminster Bridges, where the imbedded crystals are very bold and distinctly seen, especially after rain. This specimen came from near Monymusk in Aberdeen. The crystals, being nearly independant, allow us to see their determined form distinct from the gangue, which is more confused Feldspar with Quartz and dark crystallized Mica, forming a Granite. The little middle figure was easily detached, and makes a short-sided prism.

I have put the geometrical figure of it at the left hand, showing the form of the fractured rhomb, and the lower side of a prism with a triangular face; formed of a levelling from the edge of the sharpest angle of the side of the truncated end as in the little middle crystal, which also shows parallel fractures or flaws. The right-hand modification is rather more common; viz. a 6-sided column with 2 terminal faces, one primitive, or parallel to the fracture of the crystal, as in those before spoken of; and 2 directly opposite, forming at each end of the prism one primitive face & one opposite bimication, alternating with those at the opposite end. These are of the usual colour, viz. a ~~little~~ lightish red {White or transparent Feldspar being found at Adula is called Adularia Moon stone, Feldspath nacre - Haüy &c.} They are almost too hard to be scraped with a knife, but Feldspar varies much in hardness. The crystals in the Moon Stone on Westminster Bridge stand above the rest of the stone, are consequently of a harder nature, and do not wear so fast. in other instances it is found decomposing, soft, and nearly powdery {this is often called Kaolin or is frequently found in China manufactories} The primitive faces, of those figured at the apex and base of the crystals, frequently smoothly and with facility. The other 4 break irregularly or roughish. The former generally show some sparkling illuminations, which are very apparent in some specimens, and serve to distinguish which of the terminal faces is the primitive one.







Crystallized Feldspar.

Tab. 36.

Calx carbonata.

Carbonate of Lime.

The hills of Pentland near Edinburgh, are famous for Petunse {an enhancing substance used in porcelain}. The regular formation of the Carbonate of Lime placed so distinctly within the hollow is worthy of notice. The surrounding finitny Quartz, in bundles of little 18 sided crystals, line the cavity, and the jasperine Quartz {If I may so call the red coat} seems to terminate the whole pebble, which is surrounded by part of the rock of a Brown hue, called Trap, in which there are smaller or larger pebbles sometimes included, & sometimes hollows where others have been entrapped. These hollows are sometimes coated with a green or blue earthy substance called by some the Green Earth of Verona, probably owing to a mixture of Iron. The Carbonate of Lime is composed of half a very acute Rhomb with 3 langish faces of the Aquiaxe, & 3 smaller ones probably belonging to the primitive Rhomb: see geometrical fig. It is rather singular the same kind of stones excluding the Trap have been found in Wiltshire a small depth under ground.

The part of the rock this came from seems to have been a mixture, a chaotic one, Apparently a continual deposition has taken place, more still forming, and enclosing the kneading till the whole matter was deposited. In the mean time each elementary substance, according to the particular formation of its molecules, & the nature of its nearest neighbour, formed, either by itself or into combination. Thus the Carbonic Acid and Lime united together, so as to construct a crystal in the middle of this hollow as complete as circumstances would admit of, depending on the quantity of Carbonate of Lime received in solution, perfecting some faces, and depositing the other molecules irregularly. A small tinge of Iron stained the solvent, and consequently the crystal towards the top is a little coloured. The surrounding Quartz has also crystallized under similar circumstances, & is somewhat stained with the Oxide of Iron among the crystals, giving this lining a pinkish hue, which is again conspicuous at the outer side and edge next the piece of compound rock.

Crystallized Carbonate of Lime &c. in Trap.

Tab. 37.

Silex magnesiatus; var. amianthiformis.

Silky Asbestus, or Asbestus.

Div. 2. Imitative.

This beautiful substance is found chiefly in the Isle of Anglesea, North Wales; and at Portsoy, in Serpentine rocks, as they are mostly called. It is generally found found in the fissures & cracks, passing like a sort of crystallization from the sides to the centre in infinitely small spicula, being sometimes quite indurated, though retaining nearly the same appearance as that which may be easily separated by the nail. The upper figure is from Portsoy and is included in a somewhat woody Asbestos of a light colour. The lower figure came from Wales in a dirty ish Serpentine, & is partly covered with the green Nephrite or Axe Stone, nearly approaching that from the Moluccas Islands, of which the Natives make their hatchets. Amianthus or Asbestos, was formerly used for preserving the ashes of deceased persons, by

being woven into a cloth to wrap them up in while burning {In weaving it they use other threads to assist but those burn away leaving a perfect amianthine cloth; a fine specimen of which was lately preserved at Rome. See Dr. Smiths' Tour, v. 2. 201.} and by being incombustible it retained the ashes. Scotland and Wales have a satiny variety which runs in veins among Serpentines. and sometimes among a kind of Steatite. It varies in colour, but is most frequently white, satiny and so much resembling silk that there can be no better comparison. It separates into silky filaments of equal flexibility & fineness with the most attenuated thread, insomuch that they appear to divide beyond our power of examination. They seem solid, as do the filaments of all stones of this nature.

Silky filamentous Asbestos in Serpentine Rock.

Tab. 38

Calx carbonata.

Crystallized Carbonate of Lime.

Class 2. Earth. Order 1 Homogeneous.
Gen. 1. Lime. Spec. 2. Carbonate of Lime.

Spec. Char. Lime with carbonic acid effervesces with the stronger acids, and becomes quick lime in a strong heat.

Syn. Chaux aërée. Born, v. 1. 28.
Kalk-stein. Emmerling, v. 1. 437.
Aërated or mild calx. Kir. v. 1. 75.
Chaux carbonatée. Haüy, v. 2. 127.

Div. 1. Crystallized.

Syn. Spath calcaire. Born, v. 1. 107
Flath spath. Emmerling, v. 1. 455.
Foliated and sparry lime-stone. Kir. v. 1. 86.
Calcareous spar. Bab. 7.
Chaux carbonatée. Formes determinables. Haüy, v. 2. 130.

Found chiefly in lime-stone rocks wherever they occur in Great Britain, as Derbyshire, some parts of Wales, Wiltshire, Devonshire, &c.

It is easily scraped with a knife; fracture in lamina parallel to the nucleus, which is rhomboidal, its obtuse angles being 101° 30′, its acute 78° 30′. when sufficiently transparent, it gives a double refraction. It is never quite opaque, the colours are mostly white or lightish brown,

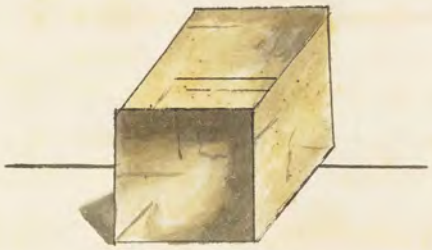
sometimes reddish, seldom yellow or green, scarcely ever crimson, bluish, purple, or black.

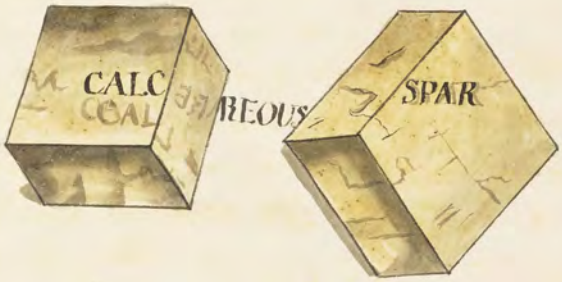
Upper figure a nearly equalsided fragment, to show the nucleus and the double refracting property, by being placed on a straight line, which appears displaced & doubled when viewed through the upper opposite face. The sides only reflect the object, for we cannot see a figure through the edges of the crystal.

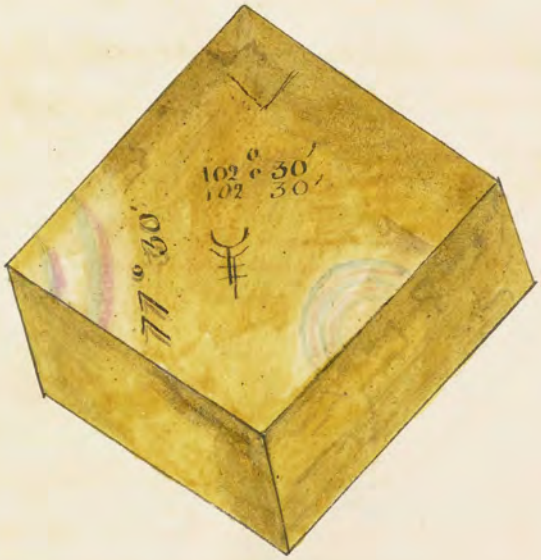
Middle figures the same, somewhat thinner, placed on letters to show that the refraction divides towards the obtuse angles.

Lower figure, a rare fragment of a fine yellow. The prismatic colours caused by the flaws are in the regular order of the rainbow: the brightness depends on the polish of the surfaces, & the closeness of the flaw nearness to the surface, &c. The upper lighter fracture is paler, because the more open it is the less visible the colours. The opaque white at the edge is in consequence of a blow in a direction contrary to the lamina, which always bruises it. for 102° 30′ read 101° 30′, 78° 30′.

vide Dr. W. H. Wollaston's learned paper on the oblique refraction of the Iceland crystal (Phil. Trans. for 1802, part 2, p. 381), for an account of its refracting property.







Carbonate of Lime, or Calcareous Spar in Fragments
to show the [illegible]

Tab. 39

Calx carbonata primitiva.

Primitive crystallized carbonate of Lime.

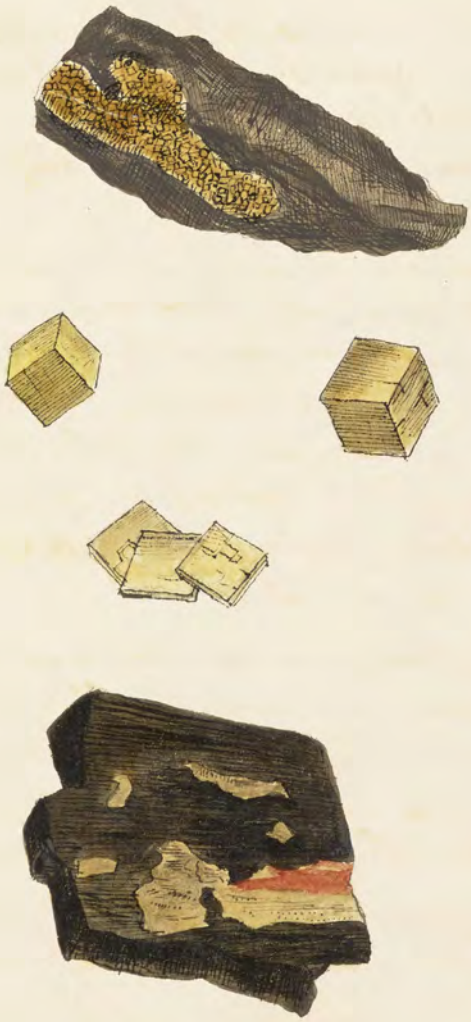
Class 2. Earth. Order 1. Homogeneous.
Gen 1. Lime. Spec. 2. Carbonate of Lime.
Div. 1. Crystallized.

Syn. Chaux carbonatée primitive. Haüy, v. 2. 132.

Upper figures. We believe these small crystals represented on the piece of pyritaceous coaly substance, are the true nucleus or primitive crystal of carbonate of Lime: It appears to be a rare thing to find them so perfect in Britain.

Those that are larger are either foreign or partaking of the pearly tint belonging to the Sidero Calcite of Kirwan, v. 1. 105. Chaux ferifère; Haüy, v. 1. 175. The line of separation is hardly discernible.

Lower figures. The fractures in the mass afford an excellent help to discern these as little flat primitives; those detached agreeing with the fractures of the flat mass. These although perhaps not before noticed, may commonly be found in thin layers, or separate in the small partings of the Newcastle coals, from nearly pellucid to nearly opaque white, not unfrequently prismatically coloured, or coated with silvery or golden coloured pyrites & may some times be found very beautiful. Wishing to make the subject familiar, I felt a pleasure in introducing a thing so easily procured.



Carbonate of Lime in Pyritaceous Coal &c.

with primitive Crystals. or Nuclei.

Tab. 40.

Calx carbonata, var. inversus.

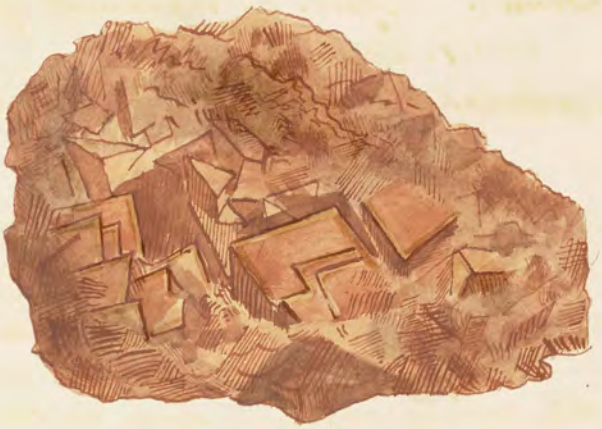
Crystallized carbonate of Lime, inverted.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 2. Carbonate of Lime.
Dio. 1. Crystallized.

Syn. Chaux carbonate inverse. E. & E. Haüy, v. 2. 183

The upper figure is a curious specimen of crystallized carbonate of Lime, with the faces of the bomb in the inverse order to the lamina of the nucleus, and their angles so near to those of the primitive, over which it is formed, as to look like the same, differing only in one degree: 102° 30, 77° 30'. This is from Bwll-y-cochan, near Conway, Carnarvonshire out of a Lead and Blend mine; it is stained probably with oxid of Iron. The edges are more transparent and shining than the other parts. The rest of the mass or matrix is crystallized in primitive rhombs mingled so confusedly that it is not readily perceived without breaking; when they are found very regular. When the term Calx carbonata is used it means crystallized carbonate of Lime.

The Lower figure is from the summit of Moel y hiraddarg, a lofty hill bounding the vale of Clyde. This is a specimen of a more confused crystallization, the red oxid being very abundant. The crystallized parts are separated in irregular columns of a romantic appearance the little White strata at the bottom have settled between the red ones in a curious manner. The fracture is irregular, depending on the confused lamina, the light falling on the flat sides of which occasions a shining lustre.



Carbonate of Lime with half relieved Crystals coloured by an Oxyd of Iron.

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Tab. 41.

Silex quartzum; var. ligniformis.

Wood-like Quartz, or Petrified Wood.

Class 2 Earths. Order 1. Homogeneous.
Gen. 4. Silex Spec. 1. Quartzum.
Dis. 2. Imitative.

Petrified Wood is by no means uncommon. It is however, equally curious with many rarities, in showing some of the phaenomena of the creation, Thus we find, when one substance passes away, another takes its place. This is an excellent evidence - that when one substance passes to decay it forms and organizes others. The water that once assisted in the rise and flourishing verdure of the wood when in youth and health, now, in decay, helps to introduce a new substance in its place, and with such nicety that it is quite a deception. The colour and external appearance are still the same, although turned to stone; and the parts of the Wood, Hydrogen and Carbonic Acid are now evaporated.

This specimen was brought from Fonthill in Wiltshire by A. B. Lambert, Esqr., V. P. L. S.

It was 18 inches long, and 12 in circumference, a fine specimen, to show the nature of the change of place, viz. the Silex replacing the carbonaceous principle of the wood; the Silex in solution, as it were, taking place of the former substance particle by particle. It is admirable to see the longitudinal and lateral fibres so perfectly arranged and coloured, with so little disturbance, that the very cracks ~~and~~ broken parts are detected with the utmost precision. Possibly the Oxide of Iron, or colouring substance, does not evaporate with the other principles: thus the colour of the parts is identically preserved. The specimen is externally somewhat granular, with the appearance of a fine-grained compact Sand-stone, more dense in the centre, resembling Flint, and in some parts almost Opal. (Wood wholly opalized is sometimes found.) Specimens of this nature are found in Ireland, and in Warwickshire, variously stained, and otherwise acted upon in the same piece, showing that the wood had been more or less decomposed, or was decomposing in different parts, before the metamorphosis had taken place. Sowerby has a piece from Aspley, which has hollows left by some insect very perfect. A most remarkable specimen of this kind, is described in Dr. Smith's "Tour on the Continent, v. 3. 113.

Wood-like Quartz, or Petrified Wood.

Tab. 42.

Calx carbonata, var. margaritacea.

Pearl Spar.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 2. Carbonate of Lime.
Div. 1. crystallized, crystal primitive.

Var. With some iron and manganese. Lustre pearly; crystals often curving.

Syn. Spherus iron ore. Kir. v. 2. 190.
Spathiger eisen stein. Emmerl. v. 2. 329. Werner.
Chaux carbonatée ferifère. Haüy, v. 2. 175.
Pearl Spar. Bab. 18.

Having so distinguished an appearance from other carbonates of Lime, this has obtained the name of pearl spar, a name it naturally suggests, & by which it is in general easily recognized. We find however, like other objects in nature, it has its gradations, and consequently blends itself with substances to which at first it seems very little allied. It may be readily traced, as formed from the primitive crystal of carbonate of lime, to an iron ore, consisting for the greater part of oxide of iron and manganese. The progress appears curiously and distinctly marked by the manner of the crystals which are in the forms of the primitive rhombs, and are white: sometimes however it approaches the appearance of ivory; and as its

substance becomes pearly, the nuclei seemes to be separating and coming from about the angle of 30° to about 20°: see the figures. They mostly appear of the natural pearly lustre, but are often at length more curled and darkened, and hence may be called spathose iron ores; perhaps they may be called iron ores whenever the common brownish aspect indicates as much. Those, however which have the forms and fracture of crystallized carbonate of lime may be placed as such while they retain the whitish pearly lustre:

Pearl spar analysed by Bergman contains

Lime	38
Oxide of Iron	38
Oxide of manganese	24
	100

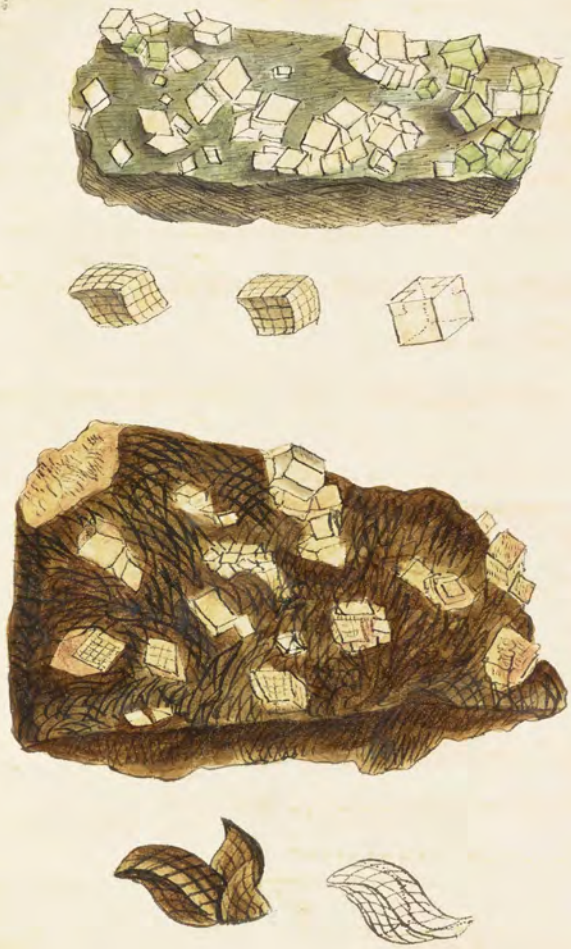
By Wolf,

Carbonate of lime	60
Oxide of manganese	35
Iron	5
	100

By Berthollet.

Carbonate of lime	96
Oxide of Iron and manganese	4
	100

These different analyses, showing a difference in the proportion of the substances of which it is composed, decide it to be more or less an Iron ore.



Two Varieties of Pearly Spar, or Pearly Carbonate of Lime.

Tab. 43.

Cala carbonata var. metastatica.

Carbonate of Lime, var. metastatic.

Class 2. Earth. Order 1 Homogeneous.
Gen. 1. Lime. Spec. 2. Carbonate of Lime.
Div. 1. Crystallized.
Var. Metastatic terminating with equiaxed and other faces.

This fine yellowish crystal shows at the apex three polished faces, which are parts of the equiaxed crystals; several others next to them show the approach to the primitive rhomb, and three primitive faces; the rest is part of an unequal-sided or flattish metastatic. The double refraction is seen, when held in certain directions, by the prismatic lines, which are very beautiful, and in some positions catch the rays of light, so as to show them in great abundance in the numerous flaws; which flaws would be some detriment to the specimen, if this appearance did not so well compensate for them. They also serve by their direction to show how the fragments are obtained which exhibit the nuclei.

Part of a large Metastatic Crystal of Calcarious Spar with an Apex of many Facets, not polished; terminating with three natural polished Faces of the Equiaxe.

Plumbum carbonatum.

Carbonate of Lead.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 13. Lead. Spec. 2. Carbonate.
Div. 1. Crystallized.

Spec. Char. Combined with carbonic acid.

Syn. White lead ore. Thom. v. 2. 203. Jameson.
Weisses bleierz. Emmerl. v. 2. 388.
Mine de plomb blanche. De Lisle, v. 3, 380.
Plomb carbonaté Haüy, v. 3. 475.

This specimen came from Wanlock Head mines, near Glasgow, forms plated octo-decaëdrons and other modifications, inclining to the appearance of sulphate of baryte, by forming a sort of Gemination on the edges. Thus the left hand figure is Geminated on the edges of the original six-sided column, forming six sided faces. Thus we should have 48 faces if they were regular. See the dotted lines on the column of the right hand figure, and also the apex which is terminated by six trapezoidal faces. This is a curious modification. The sulphuret of Lead, or galena in most cases where it is decomposing to form carbonate of Lead, has a bluish tarnish. It sometimes also becomes dusty or crumbly.

Dodecaedral crystallized Carbonate of Lead formed in Plates.

Ferrum argillaceum.
Argillaceous Iron Ore.

Class 3. Metals. Order 2. Mixed.
Gen. 7. Iron. Spec. 1. Argillaceous.
Div.

Syn. Common argillaceous Iron-stone. Kirw. 2. 173.
Lowland Iron Ore. Bab. 199.

Among other Iron ores a great deal of the sort above is used. It is chiefly Iron mixed with clay, producing 30 to 50 per cent. This variety is admired for its being devided into polygonal columns by calcareous spar. It is found in round or compressed lumps, called by the miners cats' heads or cats' scalps. It appears that the Iron clay in lumps has cracked internally, and that calcareous earth has crystallized in the fissures (These divisions depend on the vicissitudes of wet & dry, hot & cold, and approach to the nature of the Giants' causeway in Ireland, &c.) The Upper figure shows it as it commonly appears when cut. Bitumen is sometimes contained in the cracks, as are various other substances. In the middle figure the calcareous spar is mixed with blend, and is more concentrated. The lower figure is similar to the uppermost, except being external in a state of decomposition. Its redness is caused by the oxygenization of its Iron. The ~~out~~ outside is so far decayed as to expose the divisions of carbonate of lime. These are called septarium, of which there are various sorts; and besides those of iron stones those are to be found some of marle of various sizes, at Bristol, Isle of Sheppy, Richmond, &c. The sort in the upper figure is often so much admired after being split that it is often polised. The fracture is conchoidal, earthy, & the component parts more or less regular in their mixture, holding

Iron
Clay
Lime
Silex, and
Manganese.

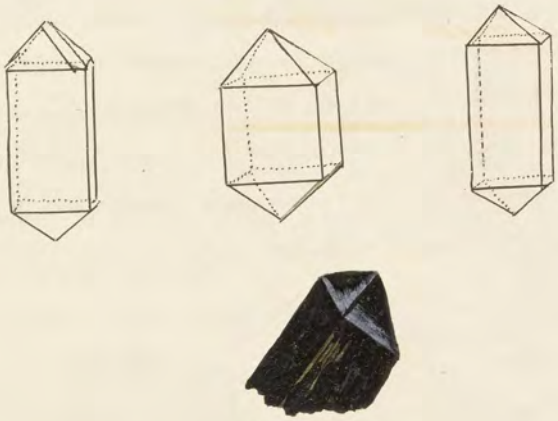
Argillaceous Iron Ore, with Calcareous Septaria, Blend, &c.

Derbyshire & Scotland.

Tab. 46.

Good specimens of oxide of tin with the proper foursided co=
=lumn and corresponding pyramid, if the edges are not be=
=velled, or truncated, are somewhat rare. Some crystals on
the present specimen are of this form, and others are trun=
=cated on the edge of the column, making a fifth face;
which truncation is generally continued on the edge of
the pyramid.

A four-sided column without truncations, or a pyra=
=mid, would be a great rarity.



Oxide of Tin in Dodecaëdrons, with eight Isosceles Triangular faces, and four Rectangular ones.

Tab. 47.

Silex Quartzum.

Agate Pebbles.

Class 2. Earth. Order 1. Homogeneous.
Gen. 4. Silex. Spec. 1. Quartz.
Div. 3. Amorphous.
Syn. Quartz agathe spheroidal. Haüy, v. 2. 423.

Agate appears to be a very ancient name given to this kind of quartzose stone. It is found on many parts of our shore, as at the Bill of Portland, Lowestoft, and on the Welsh, Scotch, and Irish coasts. It is sometimes found inland, about the Lochs in Scotland Ireland &c; and occasionally, in the Gravel-pits about London, &c. This species has been much admired on account of its resemblance to many oriental stones; and differs from our common pebbles by its toughness, which preserves it large internal flaws. According to its transparency or colour it is more or less valuable. They will often bear cutting & polishing equal to the foreign agates. The agates found on the sea coast, being rolled and jumbled together by the force of the waves, are roughened; but being hard, this roughness penetrates but a little way, and the utmost force they experience seems only to make little circular flaws; The right hand figure is from the Bill of Portland. Its outer surface is generally as here represented, but sometimes whiter. The left hand top specimen came from Lowestoft, as was, perhaps, formed by aggregation, as most agates seem to be (possibly in a trap rock,) as the cloudy appearance within seems to indicate. The next figure is of a rougher formation from N. Wales. The smooth one on the right hand, with a little red about it, has been called a Car-

nelian. it came from Lough Neagh; but it must be observed that agates, especially British ones, should not be confounded with oriental carnelians, the fracture of the agate not being so shining, & the stone much harder (this is well known to the lapidaries, seal engravers, &c., as it costs more labour & diamond dust to work them.) The next specimen on the left is a rather pellucid fragment with the edges partly blunted. The inner figure on the same line came from Derbyshire. The smaller of the two lowest one is apparently a fragment, remarkable for the resemblance to part of a septarium; the inner part resembling the upper right hand figure with a coat of a different colour. The largest figure at the bottom has a resin like appearance, which these stones occasionally have. it came from Ireland. Scotch agates all resemble these; but what are found there, especially near Berth, are admired for being striped, zoned, forming onyxes, or speckled with various blotches &c. like eyes. Moccas are a sort of agate with dendrites or figures like sprigs, trees &c. which seem to be iron, some say manganese; some called German Moccas have figures by art introduced into the flaws which in time disappear. no stones worthy to be termed Moccas have been found in Gt. Britain.

We consider agate to be nearly of the same nature or a variety of chalcedony. It is said to contain Silex 84, Argil. 10.

Agate Pebbles.

Ferrum ceruleum. Tab. 48.

Azure Iron Ore.

Class 3. Metals. Order 1. Ductile.
Gen. 8. Iron. Spec. 7. Azure Iron Ore.

Spec. Char. Contains sulphur? and Iron.

Syn. Blue martial earth. Kir. v.2. 185.
Blue iron ore. Emmerling, v.1. 359.
Fer azuré. Hauy, v.4. 119.

Very common in marshy grounds at different depths in most part of the United Kingdom. The Upper figure some found at Blackheath, or the Isle of Dogs, where great abundance was met with about 4 feet deep in a sandy loam, mixed with roots & other vegetable remains, at the depth of 9 feet it was mixed with a black clay, turf, leaves, hazel-nuts, &c. It is sometimes among earth with the remains of shells. Some was once found on the shell of the Mytilus sometimes in Hyde-park. Some found in Scotland.
The lower figure represents it as found near Kennington & Lambeth where it is common about a foot under the roads in a dirty gravelly soil, hardly hardened and somewhat appearing like the Pudding Stone. It adheres to the pebbles, but more particularly to the hollows where they have been. In trying to discover the nature of this substance, some of the purest of the sort was exposed to gentle heat which soon deprived it of the blue tint, emitting a sulphureous exhalation, with a bluish flame, & left a dark ochry brown substance, which proved to be an oxid of Iron. no prussic acid was detected by the usual method. Mr. Kirwin says its colour in its native situation when not exposed is white. This may sometimes be the case, but ours was blue even when first gathered & broken. Lustre none. Fracture dusty, of the upper figure; earthy and compact in the lower. Water does not change the colour; Oil darkens it. Klaproth thought this mineral contained phosphorus, but Mr. Kirwin thinks "the inflammability of this substance must proceed from some other principle, probably carbon, perhaps an astringent substance."

Upper figure. Pulverulent Azure Iron Ore attached to Roots, &c. Lower fig: nearly the same in the Cavities, and about the Pebbles.

1-10

Cals Fluor; var. cubica.
Fluate of Lime, Cubic.

Tab. 49.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 4. Fluate of Lime.
Div. 1. Crystallized.

Spec. Char. Lime combined with fluoric acid, which acid has the peculiar property of dissolving siliceous substances or flint.

Chaux fluorée. Born, v. 1. 355.
Fluss. Emmerling, v. 1. 515.
Fluor. Kirwin, v. 1. 124.
Chaux Fluate cubique. Haüy, v. 2. 247. $A^r_1 A^r_i$

Fluor is divisible into regular octaëdrons. Spec. grav. 3·0943 to 3·1911, and according to Haüy has a regular tetraëdron for its integrant molecule. It is mostly found crystallized in cubes (more rarely in octaëdrons and their modifications) in many parts of Great Britain, as Derbyshire Cumberland, two places in Scotland Aberdeenshire and Shetland; (Jameson, v. 1. 151.) also in Devon. & Cornwall. It may be fused by the blow pipe into a transparent glass. (It is apt to crack & disperse; which may be prevented by powdering it) Its refraction is single. The powder projected on a hot poker gives a phosphorescent light, of a bright and glowing purplish colour. some from Cumberland, greenish within, & of a dull pale crimson on

the outside; which gives this glow in great perfection, in rather large pieces, without cracking or dispersing so soon as usual; and if not too much heated the pieces will do again. In this it greatly agrees with the chlorophane of Siberia, which much resembles it in external appearance, but gives a verditer green glow on exposure to heat without falling to pieces.

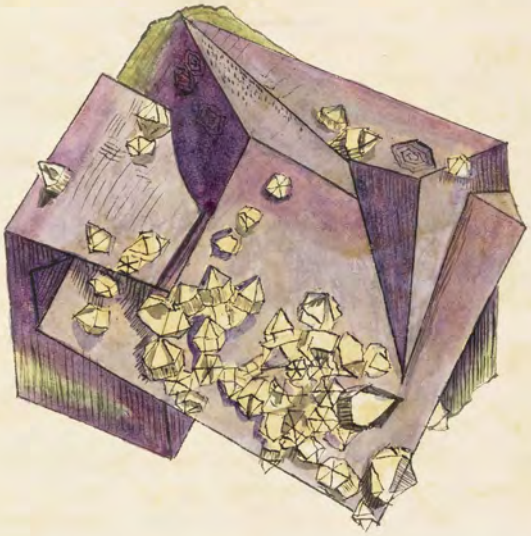
The fluoric acid was discovered by Scheele. It may be disengaged from the lime by means of dilute sulphuric acid, and has been used for etching on glass. One of the methods is this. Having a plate of glass thinly covered with wax draw with the point of a needle what ever may be desired cutting through the wax, placing the glass horizontally, so as to retain the fluid (or surround the plate with a wax wall) Then having some fluor pounded is fine as dust, spread it over the whole within the wax-en wall. Mix one part of sulphuric acid to two or three of water, & pour it on gently. The strength of the strokes will depend on the quantity of dust of fluor, & the strength of the acid that is to decompose it. The rising fumes will etch another prepared glass, if placed so as to receive them, perhaps more regularly. The acid for chemical purposes is commonly procured in a leaden apparatus. These two specimens are of the most common appearance of fluor. The upper one deviates a

little in form, the middle cube being interrupted by the side ones, contracting its upper part, so that the lower is much the broadest. There are some crystals of what is commonly called 18-sided quartz sticking about them, as usual with the spar of Cumberland.

The lower figure seems altogether of a fine deep purple but it is only thinly coated, the inside being of an olive green. The faces are remarkable for having signs of the lamina of superposition, indicating 4 sided pyramids, the apex of which appears at the edges of the cubes where in contact.

Fig. 1. shows a corner of one of the cubes replaced by six minute triangular facets.

The upper figure has some signs of superposition, though scarcely more than scratches, giving the specimen a greasy appearance. The hexangular cavity is where a crystal of quartz had stuck, and shows that the side inverted was not regular; hence it appears that the crystals of quartz are not regularly 18-sided, their shape being interrupted by the spar.



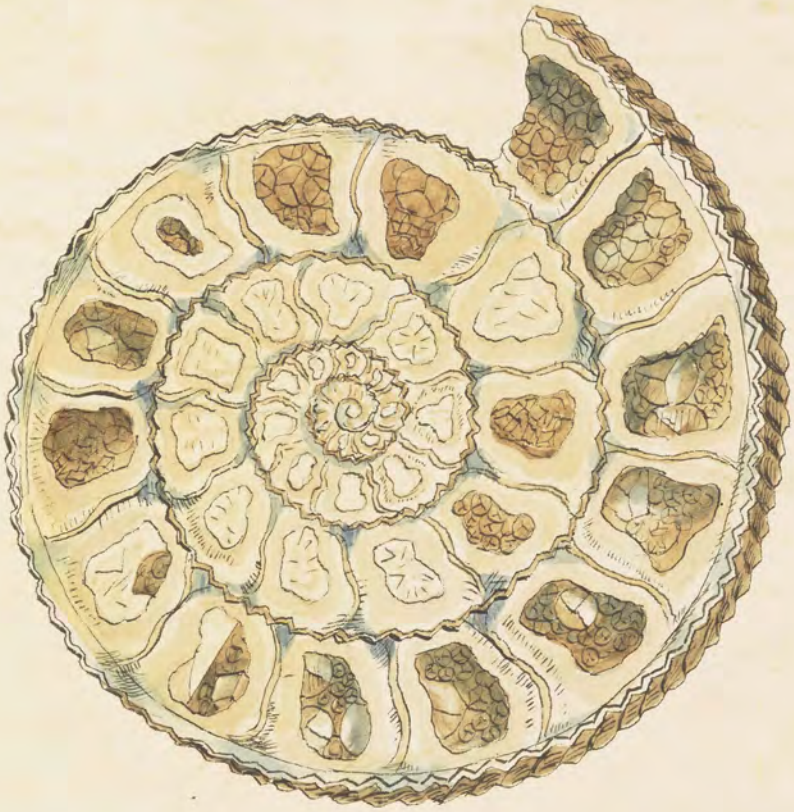
Up: Fig: Fluate of Lime, the middle cube interrupted by the side ones. Irregular 18-sided Quartz sticking about them.
Low: Fig: 2 cubes in contact showing the signs on their faces of 4-sided Pyramids, the summits of which seem attached by the edges of each

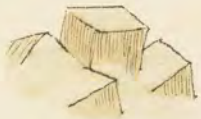
Calx carbonate, var. equiaxi-lenticularis.
Crystallized Carbonate of Lime; lenticular-equiaxed.

Class 2. Earth. Order 1. Homogeneous.
Gen. 2. Lime. Spec. 2. Carbonate of Lime.
Div. 1. Crystallized. Var. 1. Equiaxed.

The figuring of this shell will not only serve a geological purpose, and show a curious crystallization but help to explain the flattened crystals in the next but one plate, which are not easily understood, as the lines they form in the drawing give but little idea of flatness, and may seem to express the perspective of a cube, especially as we are not much accustomed yet to these representations. This is the Helminthologithes Ammonites of Linn. Gmel. v. 3. 411. usually called Cornu-ammonis, of which there are many species found in the petrified state, (This species and many others are found only in this state, never recent) abundant in many parts of Great Britain. Abroad they are often siliceous, or at least contain siliceous crystallizations; but in Great Britain they are mostly calcareous, found in Limestone rocks and marly places. The shelly part may some of it be the remains of organic structure. The crystallized internal parts of shells and stones afford a curious subject for inquiry. In the chambers of this nautilus, (for so the living genus

is called by Linnæus, see Gmel. v. 1. 3369.) the matter of crystallisations may have passed through the alveolus, or little hole, to each partition. In other shells and in geodes, it must be otherwise. The crystals are rough, and in nearly a regular series from the primitive to the equiaxe. The faces however of the latter are rounded, giving it a lenticular form. They are also somewhat striated, resembling the lenticular crystals of certain spathose iron ores.





1-12

Carbonate of Lime, or Shell, containing various Crystallizations in the Chambers.

Tab. 51.

Silex arenacea, var. calcarea.

Calcareous Sandstone.

Class 2. Earth. Order 2. Mixed.
Gen. 6. Silex. Spec. 2. Combined with calcareous Earth.
Div. 2. Semi-indurated.

Syn. Calcareous sandstone. Kir. v. 1. 361.

Masses of this, from about 8 inches to 2 feet thick, were found at near 12 feet deep in a light gravelly stratum, in cutting the canal at the Isle of Dogs. The decomposing shells have apparently undergone a change by means of subterraneous heat causing them to combine with the sand and pebbles. Some of the shells are new to Great Britain both in the natural & fossil state. These are the gibbous Arca, at the top or corner on the right hand, the hinge and cockle-like edge of which are seen distinctly above it; the oblong Arca resembling a Mytilus, on the left side, showing part of the hinge, which in no other specimen has he seen it. The decomposition of this shell & the Turbo near it, are more chalky than the others. The oblong oyster shell at the top retains its pearly lustre. Other shells have only left their impressions or cast. Some of the pebbles are cracked with the heat, & their interstices filled by calcareous matter. The whole forms a calcareous sand-stone, with very little variation, & is of a pale brown colour, (sometimes with darker yellow, sometimes a smoky black especially where wood is found with it) The parts being distinct, it forms an instructive specimen, & will serve to explain more obscure ones.

Sowerby

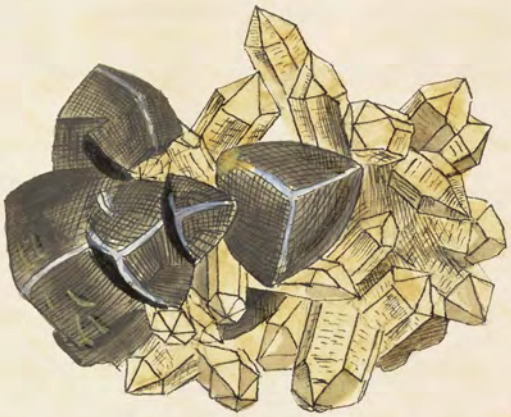
Shelly Lime, and sandy Silex or Flint,

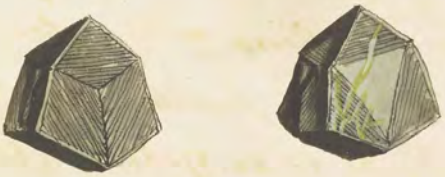
combining with the Lime, &c.

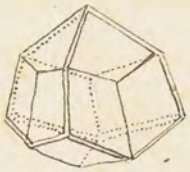
Tab. 52.

The outward aspect resembles the grey or vitreous copper ones, being of a dull grey colour, and very roughly formed, as it were of certain nuclei, which received in the direction of the solid points, or angles, give a peculiar bright shining glare. Its faces are more determined & flatter than in the other mentioned: the three hyperoidal ones of the same are not finished (see the right hand middle figure), but leave a triangular face, transverse to the original face of the tetraëdron, forming one equilateral & three isosceles triangular faces on each side, which makes altogether a new 16-sided figure. This is a modification different from any before mentioned. Haüy only finds the modification from the bevelling of the edges of the tetraëdron, as in his grey copper & copper pyrites, tab. 70 & 71. fig. 78 to 89. However, the faces o on fig. 81, 85, 86, 87, 88, 89. approach it; but the angle of incidence is that of the rhomboidal dodecaëdron with isosceles triangular faces. Most of the crystals in this group are truncated at the edges, like fig. 27 of Romé de l'Isle (see the geometrical figure at the bottom). These sloping truncations add 12 narrow pentagonal faces; & thus we have a new figure with 28 faces.

Copper pyrites may be known from Iron pyrites by its brassy colour, smooth fracture, and not striking fire with steel.







Sulphuret of Copper, with the Trapezoidal Dodecaëdron and other Modifications.

Silex Quartzum, var. aggregatum.
Quartzose Pudding Stone.

Class 2. Earths. Order 3. Aggregated.
Gen. 2. Silex. Spec. 1. Quartzose.
Syn. Pudding Stone. Kirw. v. 1. 360. Bab. 131.
Quartz-agathe breche. Haüy, v. 4. 461.
Pouddings R. De Lisle, v. 2. 481.

This is not rare in gravel-pits, in many counties of England. Hertfordshire is however most famous for producing it. Pudding Stone is little known abroad, and is therefore esteemed in Germany, and other parts of the continent, an an English rarity. Sowerby thinks it is not found either in Scotland or Ireland. (Though in Scotland they call some rocks that are avery coarse aggregation by this name). The most perfect and most esteemed specimens are those which have the closest and finest siliceous cement, with the greatest number of variegated pebbles, sometimes with fanciful representations: see left hand part of the figure. They are much the same in texture and hardness throughout as the flint pebbles before mentioned, and bear a polish equally well with them.

The upper figure is one of this sort, but is better in some parts than in others. The sides show an imperfection, as some of the pebbles are broken out having been rather moulded

than cemented, and almost loose when found. This specimen is from Hertfordshire, where some people assert they grow! This kind of stone was greatly sought after about a century ago, to be cut into trinkets, snuffboxes, coat-buttons, &c.

The lower specimen came from South-end, Essex, given Sow: by Lady Wilson. The opposite shore, at Sheppy Isle, Kent, has many varieties of it, probably washed out of the various marle cliffs of that place. This specimen is somewhat too sandy, and not close-grained enough to bear a polish. They are sometimes found very large, many feet in diam: some used formerly for querns to grind corn.

Probably the name was given by the English lapidaries; and as Mr. Kirwan observes, they meant, by the appellation of Pudding Stones, to express flint pebbles of any colour cemented with a substance of the same or a similar hardness, so as to make an equally compact stone for polishing.

Pudding Stone.

Tab. 54.

Calx carbonata; var. petrosa.

Variegated Lime-stone; or Tirie Marble.

Class 2. Earths. Order 1. Homogeneous.
Gen. 3. Lime. Spec. 4 Carbonate of Lime.
Var. 3. Amorphous.

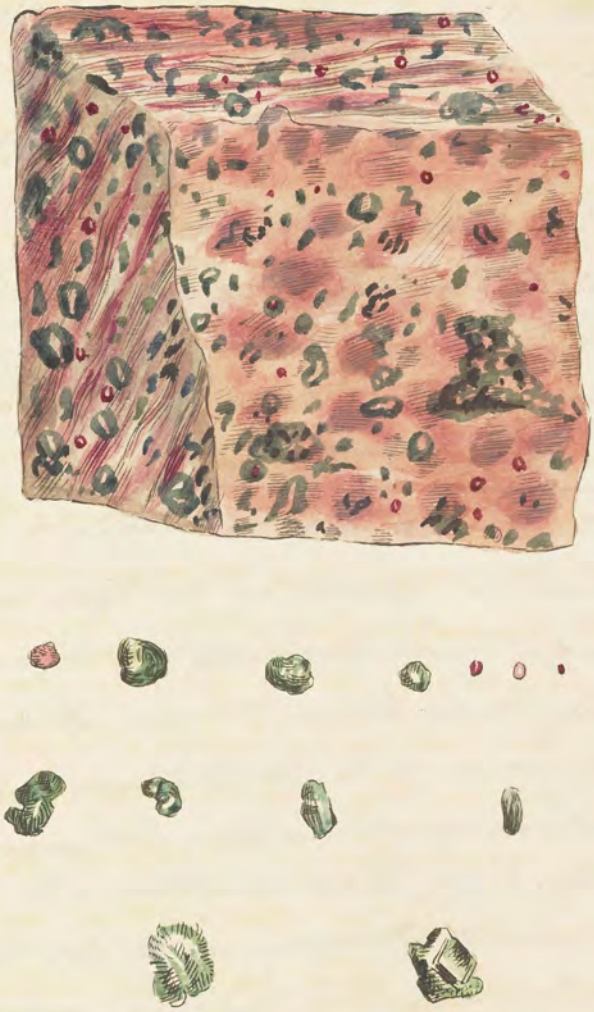
Syn. Common compact limestone. Syst. Min. Jameson, 477.

This beautiful variegated limestone comes from the hill of Belephetrick in Tirie one of the western islands of Scotland. It is said to be a primitive limestone, but is not mentioned in Mr. Kirwan's Geological Essays. It has all the common characters of limestone, with a fine splintery fracture. (Primitive limestone is not always white, nor is the grain of it always very perceptibly scaly or lamellar; but approaches, by reason of its minuteness, so nearly to the compact as to pass for such: nay it is sometimes said to discover a splintery fracture, but very rarely; sometimes its texture approaches to the fibrous. Kirw. Geol. Es. 215). It is admired for the white and red, blending and softening into spots, blotches, and undulating stria, more or less interrupted by bright little red stones sticking within it like little garnets, (Jameson says it contains little garnets: we do not find any in the

quantity of some tons which we have had the opportunity of examining), which are somewhat transparent, smooth irregular, and seem to be quartz (see the lower re-coloured figures): also white transparent calcareous spar with the common rhomboidal lamellar fracture is occasionally mixed with the stone; but more especially a light or dark olive green substance, either of an earthy or shining appearance. The earthy sort at first sight resembles chlorite, but is more or less rhomboidal in its fracture. It seems to be mixed with quartz and is irregular as to hardness. This green substance is mostly very irregular as to shape. We could only discover a small inclination to hexangular columns with irregular ends: these are sometimes smooth and shining and have whitish transverse strie, which give them the appearance of an onyx: these strie are softer than the other parts (see middle figures): some of them resemble jade, as Raspe observed, but perhaps only outwardly. They cannot be hornblende on account of their not being fusible, though it has something the appearance. nor are they now supposed to be corundum. Mr. Jameson in his mineralogy of Scotland, v. 2. 30. describes the red-coloured marble of Belephetrich as follows: Colour pale blood red, light flesh red, and reddish white. Lustre, none, except from a number of dispersed shining foliæ: Fracture, fine splintery.

Transparency: transmits light freely at the edges.

Hardness: yields pretty easily to the knife.



Tirsie Marble.

Plumbum carbonatum.

Carbonate of Lead.

Class 3. Metals. Order 1. Homogeneous.
Gen. 13. Lead. Spec. 2. Carbonate.

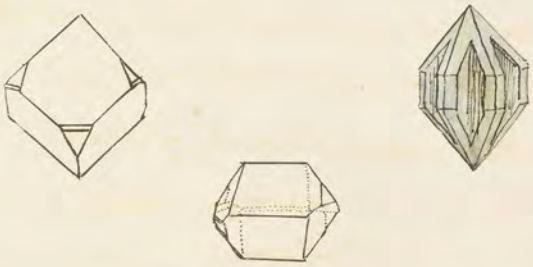
Spec. Char. Combined with carbonic acid.

Syn. White lead ore. Kirw. v. 2. 203. Jameson.
Weisses bleierz. Emmerl. v. 2. 388.
Mine de plomb blanche. De Lisle, v. 3. 380.
Plomb carbonaté. Haüy, v. 3. 475.

Carbonate of Lead has often a great resemblance to carbonate and sulphate of baryte. It has however the advantage of weight, is generally more milky in its appearance, and is mostly shorter in the cross fracture; it is also softer. When crystallised, it is more deceptive, assuming the double pyramidal dodecaëdron of quartz. It is however most readily to be scratched with a knife, which quartz will not admit of; when carefully examined, there are very few specimens of this sort that do not indicate a very anxious tendency to forming one crystal out of many plated ones. These plates are often so placed that it is difficult to see the modifications, especially to an unpractised observer. They often imitate the plated crystals of

sulphate of baryte. The present specimen is a very fine one. obtained some years since. This shows that they sometimes originate from the decomposition of ~~Galena~~ galena, and they are here yet co-loured with it. The matrix is composed of galena mixed with fluor. This curious specimen has the first modification of the quartz-like crystal, deduced from the primitive rhomb (see the left hand ~~figure~~ outline), with the column just visible: these pass into regular dodecaedrons, with very short columns, or rather octo-decaedrons; and also from the same figure in plates, which if regular, show the surfaces of 12 intersecting planes or facets: (see the right hand lower fig.) but these are seldom quite regular, & they may be so confused & indeterminate that we cannot make them out: The under figure is a modification seen on the same specimen, formed by the primitive before spoken of. having a larger deposition on some of the faces than on others, which gives it a lengthened appearance.

Analysis by Westrumb: Oxide of lead ..... 81·2
Carbonic acid ..... 16·0
Lime ..... 0·9
Oxide of iron ..... 0·3
Loss ..... 1·6
100·0



Dodecaëdral crystallized Carbonate of Lead, formed in

Plates.

Calx scriea. — Tab. 56.

Satin Spar.

Class 2 Earth. — Order 1. Homogeneous.
Gen. 1. Lime. — Spec. 2. Carbonate of Lime.
Div. 2. Imitative

Mr. Stag first made this curious mineral known in 1797. first discovered about a mile from Alston in Cumberland., washed by the River Tyne, near the level of its bed, & no where else at present. The Spot is about 30 yards long and 10 yards wide; the middle producing the broadest Stratum, which was about 4 inches and soon narrowing and becoming full of veins. The colour is white, with a beautiful satiny lustre, showing the Strata broad in the light and shade; and innumerable in the intermediate Space, varying as they are directed to the light, which is best if perpendicular to them. It transmits light at the edges, or in thin pieces. The fracture in the direction of the Striæ is fibrous, straight (perhaps with imperceptible undulations, where the lustre) some specimens are curved like the Italic S; & the fracture at right angles with every curvature. The cross fracture is nearly at right angles with the Striæ, with a compact Splintery dull surface. It is much of the same hardness with the crystallized Carbonate of Lime, does not scratch with the nail is brittle & breaks most readily in the direction of the Striæ. Mr. H. Davy jun: seems first to have described this mineral in the Phil: Mag: vol. 12 p. 364; and according to his analysis it contains,

Carbonic acid	47·600
Lime	50·080
Iron	012
Loss or water of crystallization	2·308
	100·000

Spec. grav. 2·709 to 2·721.

It has been formed into Snuff boxes &c. The blackish clay & lustre of the Pyrites give it a pretty relief; the top is an example of a septarium of some authors. The rosy blush is a dilute Iron stain.

Carbonate of Lime, resembling Satin in its Lustre, commonly called Satin Spar, discovered within these few years in Cumberland.

5
2·0

Calx Stalactites.

Lime Stalactites.

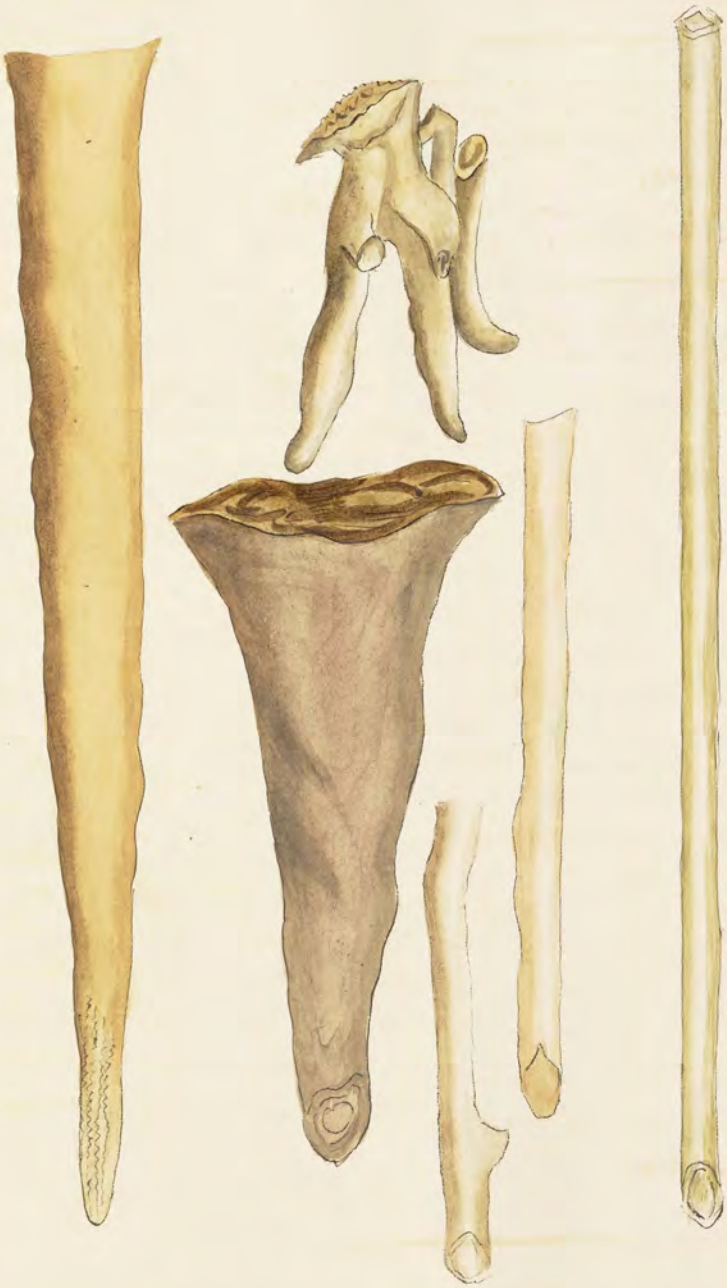
Tab. 57.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 2. Carbonate of Lime.
Div. 2 Imitative. Haüy, v. 2. 168.

Syn. Stalactite. Kir. v. 1. 88. Born, v. 1. 295.
Chaux carbonatée concrétionnée. Haüy, v. 2. 168.
Stalactites spatosum et Stizia. Gmel. 100.

Stalactites, from their nature extremely various, are chiefly found on the roofs and sides of caverns, sometimes being them in a very grotesque manner, hanging also very fancifully in the form of icicles hollow or solid. They vary in colour like other carbonates of lime and have a fracture and nucleus to the crystallized ones.

The left hand figure is part of a solid Stal.te crystallized with numerous ends of the rhomb lying together, giving an undulated appearance. These are rare, & are found in a deep mine at Castleton in Derbyshire. Upper middle figure is solid, of a whitish somewhat wavy look, altogether of the crystallized fracture, some parts showing the solid angle of the nucleus. Right hand figure cylindrical, hollow very straight and diaphanous, its outside smooth, inside crystallized in somewhat irregular spiculated rhombic forms, this specimen came from Stonesfield quarry Oxfordshire. The brownish quill formed Stal.t as the fistulose ones are called - are common. The darker sorts, somewhat resembling the middle one, are often found of various forms and dimentions. These dark ones may be coloured by clay. Kir. v. 1. 87. The lower middle figure is mostly found of an opaque and chalky appearance in wet cellars on the roofs & walls. Lady Wilson finds them continually forming in a drain at Charlton House. They occationally occur in cellars in London, &c.



1-6

Carbonates of Lime in the form of Stalactites; varieties.

5
2.2

Chalk when burnt to Lime contains from 5 to 10 per cent of sand or clay — Lime Stone from 50 to 80 some also contains Magnesia which is prejudicial to vegatable life (vide Alderson on poor soils)

Calx Creta.
Common Chalk.

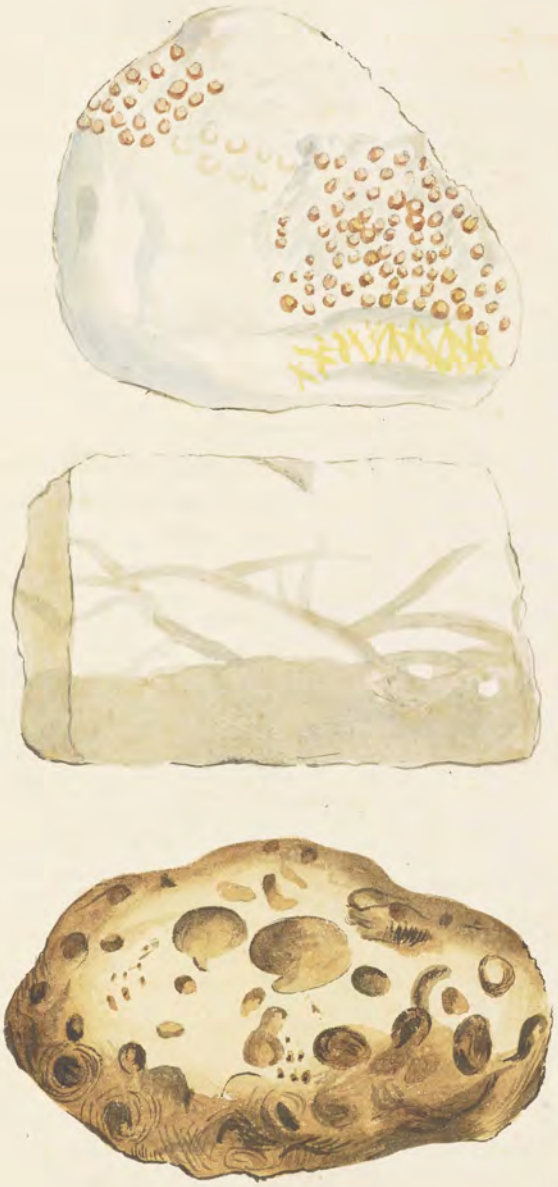
Tab. 58.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 2. Carbonate of Lime.
Div. 3. Amorphous.

Syn. Chalk. Kir. v. 77.
Craie compacte. Born, v. 1. 281.
Chaux carbonatée crayeuse. Hauy, v. 2. 166.
Creta scriptoria. Linn. Syst. Nat. v. 1. 206. Gmel. v. 3. 86.

Albion Cliffs, famed of old, are the chalk hills of Dover. Chalk abounds in many parts of Britain. There is no chalk in Cornwall. Chalk is understood to be a precipitation of carbonate of lime holding a little clay and some flinty particles. It is often in very thick strata, frequently under sand. Flints in strata are common in it. The stratum is mostly horizontal, sometimes otherwise, as at the Isle of Wight. Many remains of animal nature are found in chalk as shells, echini, corals, &c. and with the rhombic fracture: sometimes the echinites are filled with perfect flints. Marcasitic pyrites, or sulphure of Iron is not uncommon in it, either in full metallic splendor, or in different stages of decomposition passing into Oxide or Oxid of Iron. It is remarkable that Mr. Kirwin says in his Geological Essays p. 235, metallic substances are never found in Chalk. Yet in France Marcasitic pyrites are said to be found in it, as if it were not found in England. pyrites are found in Chalk of Sussex; between Dover & Margate at Goodstone also in great abundance, where the Chalk in various ways passes into fine grand micaceous lime stone called fine-stone, brought in abundance from Ryegate. Upper figure a lump of Sussex chalk with a conical fracture, not uncommon. The little granulae of fine gravel so regularly found around it, seem to be a filtration of water carrying sand with it, through some loose chalk which meeting with a more compact here turns down the side in drops, & at the same time is absorbed by the chalk leaving no sand on the surface in little globules. Sometimes quantities of sand fall into the Chalk, and are called by the Workmen Sand Gulls. Middle figure. Chalk passing into lime stone, hardening with inosculating veins. Lower figure chalk rounded by rolling in the Sea, perforated by the Mytilus rugosus, or some species of Pholas: being stained it loses the appearance of Chalk. Harder substances are often perforated by testaceous animals.

Galium calcareum, English Botany, t. 191, should seem to indicate good chalk, as I have found the best where it grows.



1-7

Carbonates of Lime, common Chalk, & varieties.

Calx petrosa.
Lime Stone

Tab. 59.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1 Lime. Spec. 1. Carbonate of Lime.
Div. 3. Amorphous.

Syn. Pierre à chaux commune. Born, v. 1. 284.
Kalkstein. Emmerling, v. 1. 437.
Compact Limestone. Kir. v. 1. 82.
Chaux carbonatée grossière. Haüy, v. 2. 166.

Limestone, generally speaking, is carbonate of lime, harder than chalk, often containing 10 or 12 per cent. of clay or iron. If so much as 15, Mr. Kirwan says it should be excluded, as scarcely affording good lime in burning.

Upper figure. Kelton-Stone, found in abundance at Kelton in Rutlandshire. It is remarkable for its singular accretions in the form of fishes roe, whence it is often called Roe-stone. It is used for building in many places. Some of the colleges at Cambridge are built with it. The same uniform appearance extends to very large masses; and although a sound strong and durable stone in the mass, very little pieces may be crumbled to grains by the fingers. The masons use a common carpenters saw in working it. The little rounded particles being easily detached, it passes readily through it. They sometimes have a little dusty or solid nucleus, coated concentrically; at other times are hollow. In the next county Northamptonshire, there is a stone called by the masons Barnack greatly resembling this, but coarser, containing shells, &c. Col. Walford found a stone of a similar nature with larger grains (which approaches the oviform limestone of Kirwin, v. 1. 91), at Birdbrooke, Essex, mingled with shells, which has sometimes sufficient clay or argil to be called a marle.

Middle figure. Bath Stone, frequently contains the same concretions, but more decomposed, and a matrix surrounding them somewhat confusedly crystallized, forming little hollows: many species of Shells, encrini, &c. are found in it; sometimes however so comminuted as to be quite indistinct. I picked up a piece of Stone at Burford in Oxfordshire which is of a reddish brick colour, with the hollows very distinct giving it a volcanic or cindery appearance. With difficulty very small pieces crumble between the fingers.

Lower figure. Portland Stone - nearly like the Bath Stone: The best sort is more compact, and whiter: there are many varieties of it, passing into marly, flinty, &c. It often affords good crystals. The specimen figured had some little rombs half relieved on it. A crystallization called, from its resemblance, sugar candy spar is frequent among it. it appears in the form of large trunks of trees. hardest within, resembling whitish chert.

Ketton - Stone, colour light reddish brown, lustre 0.
Transparency 0.
Fracture earthy granular.
Hardness 5 or 6.

It contains 90 per cent. calx, and 10 of argil. The Bath and Portland nearly the same in ~~both~~ most respects but harder.

Spec. grav.	Ketton	2·456	Kir. v. 1. 88.
	Bath	2·494	
	Portland	2·461	

Carbonates of Lime, viz: Hetton Stone, Bath Stone and Portland Stone.

1-8

6
20

Calx corallifornis.

Coral-form Carbonate of Lime.

Tab. 60.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1 Lime. Spec. 2. Carbonate of Lime.
Dis. 2. Imitative

Ellis corallines, p. 76. tab. 27. c.

These curious chalky accretions are found plentifully in the loose marle at S. Maws, Cornwall, which abounds also with shells of various species, and is brought to Truro to be sent to different places for manure: in Wales they are found. Their resemblance to corals has caused them to be mistaken for such; but on a careful examination, they are found to be only aggregations of calcareous earth, accumulated upon little nuclei, ramifying in the soft marle, and occasionally attracting other calcareous particles, which form fresh coats like the bark of a Tree, and are not unlike the coats on the nuclei of the Kelton stone lengthened out, as the broken ends plainly show. They vary extremely in their forms, and when large are sometimes perforated on the outside, apparently by some marine insects; which has caused some to think them of animal construction. Nature ever allowing certains bounds to every species of her productions, permits them to separate from one another in many nice and curious ways. Thus calcareous earth in this instance is separating from the clay in the form of opaque branching corals.

The small specimens are very much branched, and mostly white, but somewhat softer to the touch. The larger are often coloured with iron, perhaps some animal substance, as the place in which they are found contains many dead shells. Sometimes they contain some salt, which is readily perceived by the taste, even remains after drying in the cabinet: some have no saline taste.

Carbonate of Lime, Coralliform Varieties.

Tab. 61.

Calx carbonata var. aequiaxis.

Crystallized Carbonate of Lime, var. equiaxed.

Class 2. Earth.	Order 1. Homogeneous.
Gen. 1. Lime.	Spec. 2. Carbonate of Lime.
Div. 1. Crystallized.	Var. 1. Crystal Equiaxed.

Syn. Chaux carbonatée équiaxe. $\frac{13}{8}$ 1. Haüy, v. 2. 132.

This crystal is formed of six rhomboidal faces the angles of which are 114° 18′ 56″, and 65° 41′ 4″, forming a very obtuse rhomb, the axis of which is equal to that of the rhomb which it encloses. Haüy, v. 1. 138.

These and their modifications are found plentifully in Durham and Cumberland. Some from Newcastle found in the Coal mines. They occasionally occur wherever other calcareous substances are found.

The upper figure is part of a fine specimen with clearer crystals than usual, for they generally incline to a milky one. They frequently stand on their edges, or are as it were thrown about in different directions, on various matrices. This is on dark gray Lime-stone, with blend (an ore of Zinc called by the miners black Jack) and Galena (an ore of Lead) The first is confusedly crystallized, which commonly happens; the latter more regularly so, in cubes with the corners truncated, or a

into-octaëdron, as Haüy rightly terms it.

The lower figure has smaller crystals, roughish towards the edges, as if not quite finished. The roughness proceeds from the edges of the molecule, or from spaces where there seems something wanted to finish the faces and make the surfaces even. The crystals are somewhat striated toward the centre, and are loosely fixed among light purple fluor and galena.

Carbonate of Lime, in flattish Rhomboidal Parallelopipeds, scattered in different directions, with Blende & Galena.

Ferrum oxygenizatum, var. radiatum. Tab. 62.

Radiated Oxide of Iron, or Hæmatites.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 7. Iron. Spec. 3. Oxide of Iron.
Dio. 2. Imitative.

Syn. Red Hæmatite. Kir. v. 2. 168.
Rother Glaß-kopf. Emmerl. v. 2. 313.
Hematite. Haüy, v. 4. 105. De Born, v. 2. 287, XI, F. c. b. 1.

The Hæmatite Iron-ores are found near Silverstein in Lancasire in great plenty. The upper specimen is singular from the separating & divaricating radii. The lower figure shows more of the usual structure of these ores, which often form large roundish or irregular nodules, sometimes kidney-shaped, botroidal, &c. the masses radiating from one or more centres, 6 inches or more in length, & casting or coating one over the other. They are mostly of a Brick red colour easily staining the fingers, particularly the powdery parts:— The harder parts also stain the fingers much, and by a little rubbing give a black tinge with a bright lustre like black lead. Those parts which have lost the red appearance, and approach the metallic or Iron do not so readily stain the fingers. on being ground these give a dark red colour; whence this ore has been called blood-stone. Sometimes the harder black sort with this property has been cut into burnishers for gilders. These ores are said to contain from 40 to 80 per cent. of Iron. The harder kind is sometimes a little magnetic, if reduced to powder, particularly if heated on charcoal; which deprives it of a certain degree of ~~x~~ oxygen. "Fracture coarse or fibrous, parallel or diverging, earthy." may be scraped with a knife. or strike fire with a steel. Spec. Grav. from 4 to 5, Kir. "This ore contains besides some manganese much argill, which makes the Iron it affords Red-short, that is, brittle when red hot." Kir.

Red Hæmatites Iron Ore.

Silex arenacea. Tab. 63.

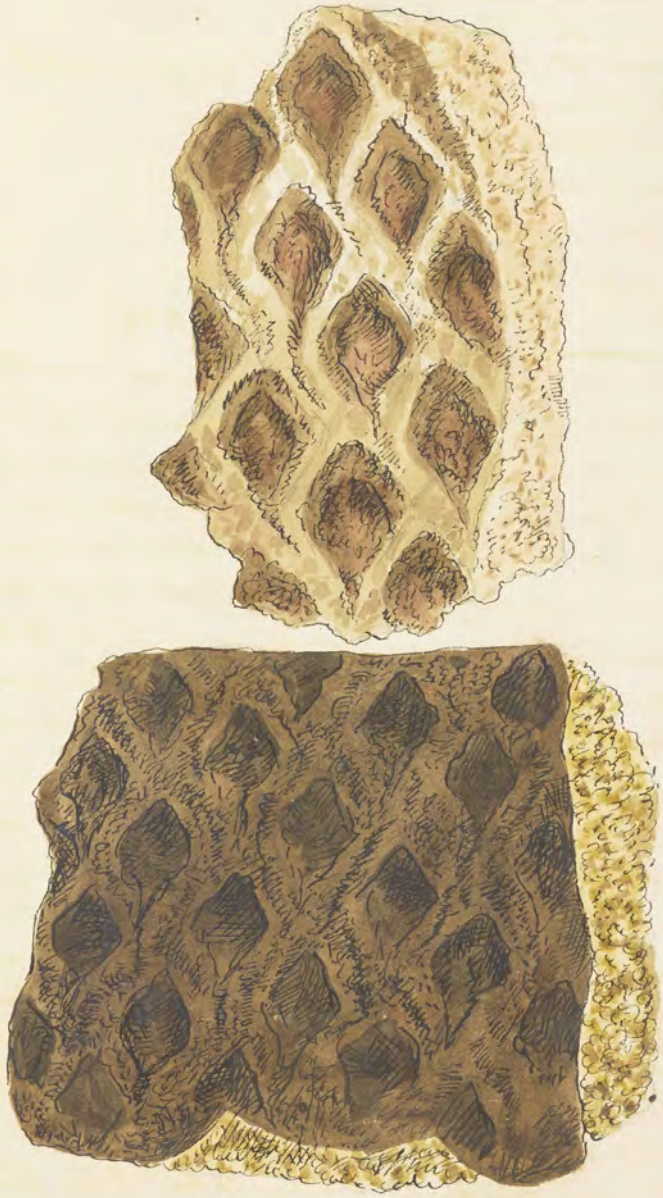
Siliceous Sandstone.

Class 2. Earths. Ord. 3. Aggregated.
Gen. 6. Silex. Spec. 2. Grains of Silex more or less agglutinated.
Div. 3. Amorphous.

Spec. Char. Fracture granular.

Syn. Siliceous sandstones. Kir. v. 1. 364.
Lis friabilis. Linn. Syst. v. 3. p. 63. 9.
— coagmentata. Linn. Syst. v. 3. p. 63. 10.
Quartz arenacée agglutinée, ou Grès. Haüy, v. 4. 464.

Sandstones may be said to be composed chiefly of quartz in smaller or larger particles, which, according to Kir., should not exceed one 3d of an inch in diamr. In the representation of such as are not primitive sandstone, it is thought of much utility to put those which have impressions on their surfaces of plants, shells, &c. formerly organized, that while we acquire a common idea of the substance, it may help geological purposes, which will be found extremely essential in mineralogy, as it leads to the era of formation of different strata, distinguishing by such helps the more recent from the most remote. The upper figure is chiefly composed of irregular whitish grains of quartz cemented to each other by a sort of agglutination of its own particles, & in some parts with oxide of Iron, which gives it the brownish tinge: it has a few specks of mica, & a very little decomposed feltspar, the specimen came from Durham. The lower figure is perhaps the coarsest sort of sandstone, much the same, but looser texr with more decomposed felt spar, it came from Walmington Cumd. The coarseness of the stone shows plainly it could not be formed by human hands with the present beautiful ornament, which equals in simplicity some of the most admired ornaments of antiquity & may perhaps give ideas to modern architects. The impressions seem to be like the leafy scales of some unknown stem of a plant to us — they are most like some foreign Euphorbia or Cactus.



Coarse Sand Stones.

Tab. 64.

Silex quartzum primitivum.

Primitive crystallized Quartz.

Class 2. Earths. Ord. 1. Homogeneous.
Gen. 6. Silex. Spec. 1. Quartz.
Div. 1. Crystallized. Var. 1. Primitive.

Gen. Char. Rough and hard to the touch. Soluble in the two fixed alkalis; but in no acid but the fluoric, except (as some think) when in combination with an alkali, much diluted with water; also soluble in 1000 times its weight of water.

Spec. Char. Nearly uncombined. Burns to an opaque white. Spec. grav. 2.64 to 2.65. Kir.

Syn. Quartz. Kir. 1. 242.

Haüy says that the primitive crystal of Quartz is the slightly obtuse rhomb, measuring 90° 40′ and 85° 56′. He does not seem to have met with a specimen. Sowerbys is formed in a variegated flint, from Lewisham in Kent, showing only one end of the rhomb, agrees with this description, as the primitive: some of them show signs of the other three faces, approaching the double hexaëdral pyramids. see left hand figure. Silica when transparent and crystallized is commonly called Quartz, Rock Crystal, or Mountain Crystal; the purest are generally colourless, and often very brilliant. They were formerly much esteemed,

and known by the Jewellers under the name of Rock Crystals, and Scotch, Welch, or Cornish Diamonds; nor do Jewellers seem to distinguish between Rock Crystal and Quartz, although they chiefly use Rock Crystal.

It is sometimes found yellowish, or of a topaz colour, passing to red, purplish, brown, black, &c. Its lustre is glassy; it is more or less transparent, and is said by most authors to have a double refraction: Sowerby could not discover this circumstance. The fracture is coarse, splintery, conchoidal, or undulating, the flaws frequently iridescent. Hardness 10. Very brittle, strikes fire with steel, and scratches glass. It is the chief ingredient in making glass, when fused with potash, soda, &c. and seems to be only a purer kind of flint. Diamond has generally been classed as the first species of Silex, but it has at length been discovered to be the purest species of Carbon. Quartz seems ~~to be~~ very properly to be distinguished from Rock Crystal by Fire. The former if exposed to a strong red heat becomes of an opaque white: this specimen is therefore truly quartz, as a fragment has been proved, which being exposed to a strong heat in a common fire became first of an opaque white, and by a longer exposure somewhat opaline, or rather like chalcedony; not unlike common flint under similar circumstances. Rock Crystal on the contrary, originally dark brown, &c. by the same heat became beautifully transparent, as some lapidaries and jewellers well know.

Primitive Rhomboidal Quartz, with geometrical figures showing its passing into the Dodecaedron with triangular faces.

(-4)

Tab. 65

Calx carbonata, var. metastatica.
Carbonate of Lime, var. metastatic.

Class 2. Earth. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 1. Carbonate of Lime.
Div. 1. Crystallized. Var. Crystal metastatic.

This specimen shows a variety of faces depending on certain laws of increase and decrease; and seems more regularly forming the metastatic within, where it abounds with pyrites, then externally. This serves to show that crystallization may continue while one substance has another within it. The pyrites from their colour, as well as form, should seem to hold copper as well as iron.

A more confused Crystal of the same of a greenish cast, including Pyrites of silvery and golden Lustres, &c. see p.

Cuprum arseniatum.

Arseniate of Copper.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 4. Copper. Spec. 9. Arseniate of Copper.
Div. 1. Crystallized.

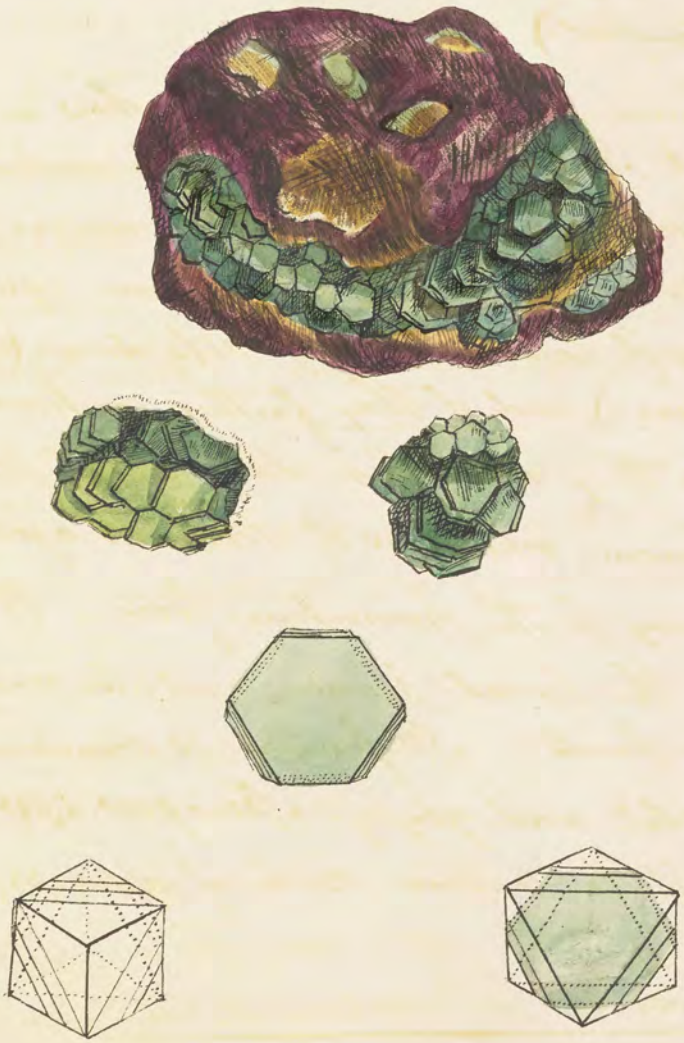
Var. Crystal an hexaedral plate with inclined edges.

Syn. Cuivre arseniaté lamelliforme. Haüy, v. 3. p. 578.
Arseniate of copper in hexaëdral lamina, with inclined sides. Phil. Trans. 1801, p. 176.

This beautiful variety is described by Count Bournon in the Phil. Trans. for 1801, according to him "It is in very thin hexaedral lamina, the six sides alternating in an inclined position, with the broad hexaëdral planes on either side at an angle of about 135°, and the third at 115°, on the opposite side." See fig. 1. The crystals are more or less piled on each other, and are often to be divided, or split parallel to their surfaces, in the same manner as Mica. They are very brittle, mostly of an emerald green, and as transparent as the best glass, their lustre resembling the thin glass called frosting; or, as the Count says, the lustre of those coloured metal plates called foil, & are most splended when the light falls on the broad planes.

The edges are more opaque, partly from the contrary direction of the crystal, and partly from the striæ in the direction of the laminæ. Fig. 2. is a general group of crystals. Fig. 3. shows a variety in Sowerby's possession of a yellower tint. (These two are somewhat magnified)

The lower geometrical figures, show according to the measurement of the Count, that if the inclined sides were to be increased by a regular set of decreasing plates placed upon the surface till they formed an equilateral triangle, they would become oblique octaedrons, (see the right-hand figure;) and if they further continued on these planes till they were lost, they would produce a rhomboidal prism, which, as it seems to agree with the fragments, may be the primitive form. It splits into laminæ on the broad planes, and also readily does so with the side facets. Its fracture is sometimes irregularly conchoidal and glassy. Spec. grav. 2,548. Mr. Chenevix found it to contain oxide of copper 58, arsenic acid 21, water 21.



Arseniate of Copper in hexaëdral Plates, &c.

Tab. 67.

Calx carbonata, var. metastatica.

Carbonate of Lime, var. metastatic.

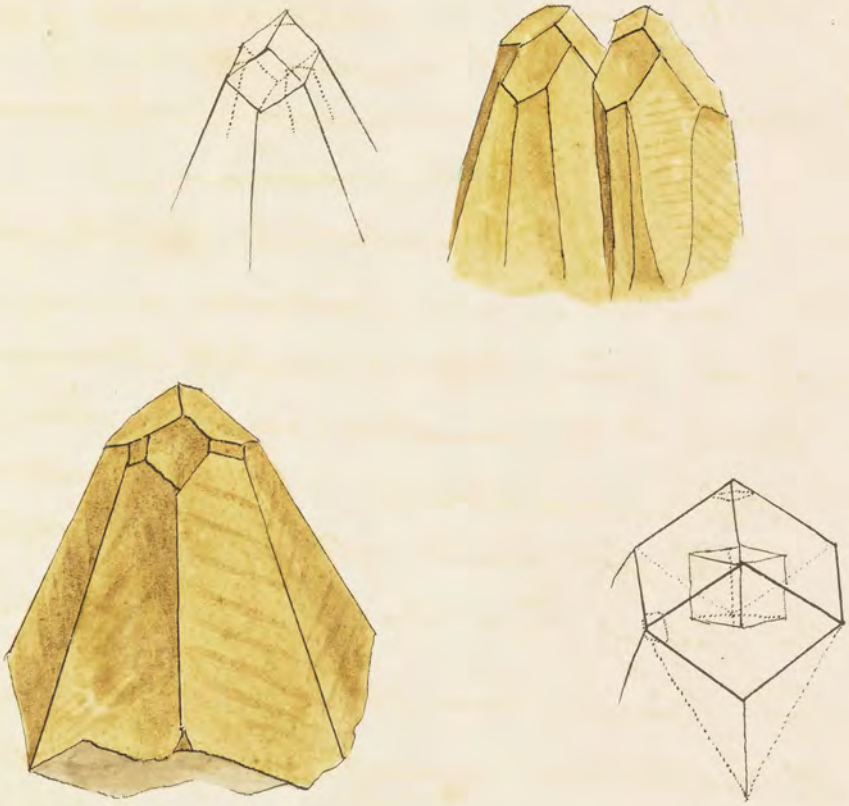
Class 2. Earths. Ord. 1. Homogeneous.

Gen. 1. Lime. Spec. 2. Carbonate of lime.

Div. 1. Crystallized

Var. crystal metastatic terminating with primitive facets.

Upper figures. The metastatic crystallization, is formed as before observed, by a particular arrangement of the molecules, which, stopping abruptly, terminate in the obtuse point of the primitive crystal, showing three faces. This termination is not very common: the outline on the left hand will help to explain it. The other lateral faces are spoken of in another place. The lower figure shows the equiaxe termination, and the right hand geometrical figure, its formation upon the rhomb.



Fragments of Dog's-tooth Spar; the upper figure with the Apex Primitive-formed; the lower figure with the Aequiaxe Termination.

Tab. 68.

Cuprum oxygenizatum, var. octaëdrum.

Crystallized Red oxide of Copper.

Crystal Octaedral.

Class 3. Metals Ord. 1. Homogeneous.
Gen. 4. Copper. Spec. 3. Oxide of Copper.

Spec. Char. Copper combined with oxygen.

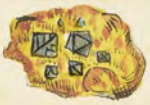
Syn. Red calciform copper ore. Kirw. 2. 135.
Native oxide of copper. Bab. 174.
Roth-kupfererz. Emmerl. 2. 213.
Cuivre oxydé rouge primitif. Haüy 3. 557.

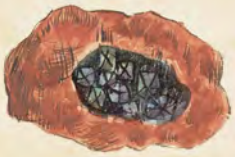
Some of the crystallized red oxides of copper deserve from their lustre the appellation of Ruby Coppers more than others, which are shown in another part. The present fine specimen has more of the steel like lustre, as most of the octaëdrons have: however, the beautiful red sparkles internally with much brilliancy. It is not difficult to scrape with a knife, and the least scratch produces a rich red powder of the colour of the gum called Dragons Blood. (known in the Pharmacopœia by the name of Sanguis Draconis, and extracted from Calamus Rotang of Linnæus) The specimens look red most by candle light.

They are found in Wheal Unity, near Redruth, in Cornwall, & in other parts of that county, as well as in different parts of Europe. Foreign specimens in general seem not to be superior in the size or perfection of their crystals to the Cornish ones. The matrix of the upper figure is shattery quartz, supporting native copper; from which the oxide seems to proceed. It is worthy of remark, that this kind of oxygenizement should form so regular a crystallization, for it appears to be only a decomposition of the native copper from which it commences. The lower figures are in different matrices, — one in red powdery oxide of copper & iron; the other in an ochraceous matrix, chiefly oxide of iron. It agrees with the following parts of Mr. Kirw. description: "It is often cochineal red, or intermediate between bluish-gray & carmine red. Found massive, investing, disseminating:" he does not mention its being found crystallized. "Fracture even, approaching the minute conchoidal, sometimes earthy. Hardness 4 to 5, brittle. Effervesces with nitrous acid, to which it gives a green tinge, and a blue to caustic volatile alkali." Thus much till Mr. Chenevix had shown that there was only one proper oxide of copper of a black colour, and that the present species is rather a suboxide of copper, containing

Copper	88·5
Oxygen	11·5

whereas the black oxide contains 20 per cent. of oxygen.





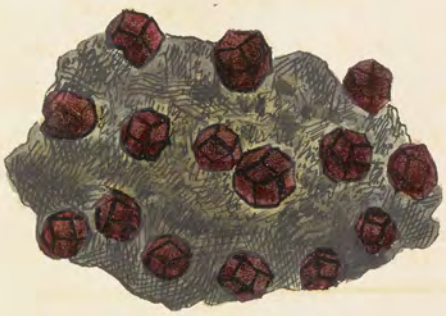
Ruby or Red Oxid of Copper in octaëdral Crystals. &c.

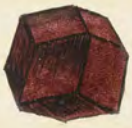
Silex granatus. Garnet.

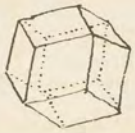
Tab. 69

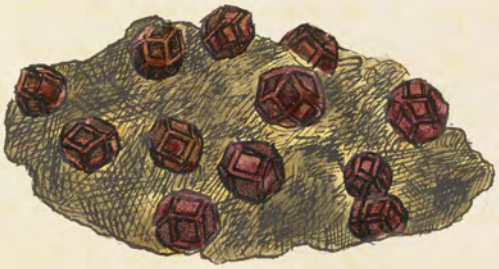
Class 2. Earths. Order 1. Homogeneous.
Gen. 6. Silex. Spec. 13? Garnet.
Div. 1. Crystallized. Var. 1. Dodecaëdral, or primitive.
Spec. Char. Primitive form, the rhomboidal dodecaëdron; scratches quartz.
Syn. Garnet. Kirw. 1. 258.
Granat. Emmerl. 1. 43, & 3. 246.
Borax granatus. 1. 43 Linn. Syst. ed. 13. v. 4 p. 96.
Grenat. Haüy, 2. 540.

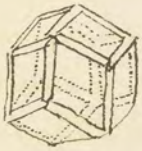
Garnets are of various degrees of hardness. The oriental and Bohemian are the brightest & hardest, but all want the lapidary to thin them, & show their lustre, The British are not valued by the lapidaries. They are chiefly found imbedded in micaceous and granite rocks, though sometimes otherwise. Besides the other ingredients spoken of in garnets the British often hold particles of Mica, & are less firm. but they present most of the different forms of crystallization. This representation is what is called the primitive crystal (viz) the rhomboidal dodecaëdron. These are found in great plenty in the Plumb-pudding rocks, at Shuntly in Scotland. We have bought specimens at sales said to come from Bohemia of the same sort, & in the same gangue as those from Shuntly. The Syrian garnet is more scarlet. though some of the Scotch are nearly of the same colour, less bright. The lower figures are from rocks near the same place in a lighter-coloured gangue (a granate), with the edges of the dodecaëdron forming 24 narrow hexaëdral facets, in addition to the 12 rhomboidal. Sowerby has one in a basaltic stone, & green horne from Scotland. Jameson has found them in micaceous schistus, v. 1. 219. v. 2. 212. External lustre casual, internal 2. 3. 1. of the brownish and blackish frequently 0. Kirw. Fracture of the hard ones somewhat shiny or conchoidal. Mr. Kirw. calls the oriental garnets carbuncles, p. 258.











Garnets in their Matrix, showing the Rhomboidal Dodecaedron.

Tab. 70.

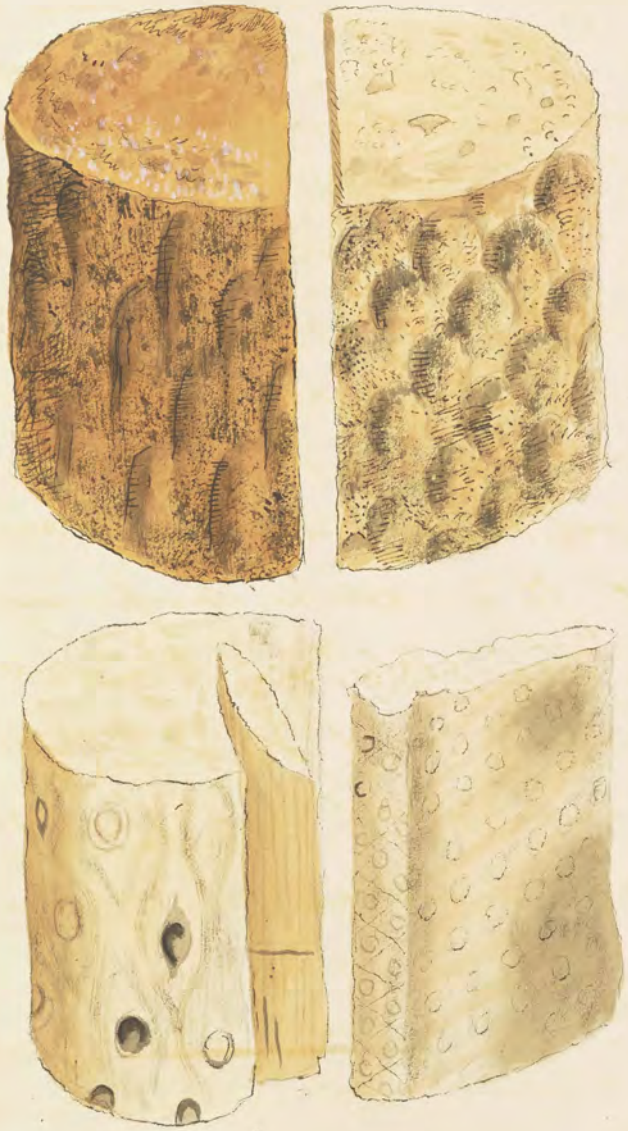
The upper specimen is nearly of a straw colour, and diverges in a stellated manner from a common centre, with a good deal of the appearance of Fonthwood. Some are of different shades of green, which somewhat resemble the Byssus-like carbonate of copper. See the surface of the lower figure, where there are also the various colours from straw to dark brown, some of which appear of the colour darkish brown rotten wood, a little resembling the wood Tin Ore of Cornwall, but may be readily known from it from being not so heavy. This appearance occasioned the common denomination of Wood Copper, before Count Bournon's paper was published.

Amianthiform Arseniate of Copper of the texture of rotten wood, forming Mellated radii, &c.

Tab. 71.

The lower figures in this plate are of the finest texture: the particles in the right hand figure are so fine as scarcely to be discerned without a magnifying glass: the fracture which is a little shattery as well as earthy, in some parts readily shows the sand-like texture, It is more strongly cemented in other parts by means of a very little lime, and more strongly still by a siliceous cement. The original of the impression we do not at present know. The particles in the left hand figure are somewhat larger but are more compactly agglutinated by the siliceous cement, and seem as if more or less fused into each other somewhat approaching the vitreous appearance. The impression seems to belong to some vegetable, possibly furnished with spines in the order where the little ovate knobs appear, (one figure is marked as if with the impression of Bamboo stalk) The upper figure with the long squamæ is what is called by Kirwan ferruginous Sandstone. It is coloured with an oxide of iron which seems to be in that state of oxygenization on the outside, which has the conglutinating power ascribed to it by Mr. Kirwan; and is consequently more compact on the outside than on the inside. Pebble stones held together in this manner are very common in gravelly places about London.

The right hand upper figure is a coarser stone of a similar nature, with some pebbles occasionally here and there about it; also some lumps of a chalky appearance resembling decomposing feldspar, Thus it is perhaps next in order to the Rubble Stone of Hirw. v. 1. 366. Sandstones are found in many parts of England, and are of great use. They are natural filters in the Laboratory of nature, and are now become a modern branch of traffic in Derbyshire, London, and other places, for filtering water. They are brought from Newcastle for grindstones, sharpening of scythes, rubbing down copperplates, &c. Some sorts have been used for buildings, as at Windsor Castle, which is chiefly of the whiter kind and fine grained. The gray and black blotches are explained in another place.



1-40

Various Sand Stones

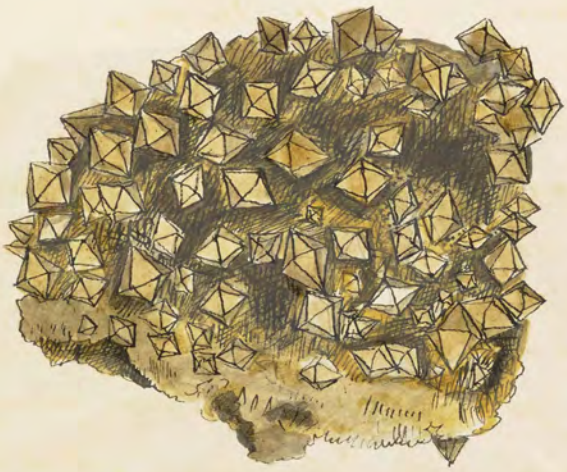
Tab. 72.

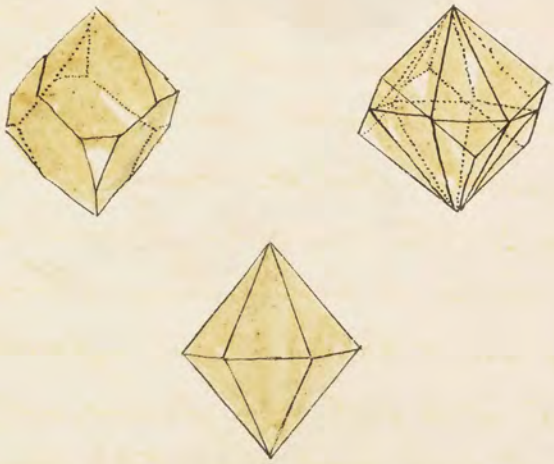
Silex quartzum. var. dodecaëdrum.
Crystallized dodecaëdral Quartz.

Class 2. Earths. Order 1. Homogeneous.
Gen. 6. Silex. Spec. 1. Quartz.
Dis. Crystallized. Var. Dodecaëdron with triangular faces.

Syn. Quartz. Bab. 80.
Quartz-hyalin dodecaëdre. $\frac{P\,\frac{1}{2}}{P\,c\,z}$ Haüy, tab. 40. f. 1.
Cristal de roche dodecaëdre. De Lisle, t. 2. p. 70.

The regular dodecaëdral crystal of quartz is somewhat rare. Dr. P. Murray gathered an irregular group from Craig Lackart, about 3 miles from Edinburgh. It is evidently taken from a rock externally in a state of decomposition, as its matrix is porous and mixed with red oxide of iron. It is sometimes found at Bristol, and also on the Lancashire iron ore hæmatites, Bab. 80. Sowerby has a specimen on iron ore from Devon. The one here figured is from Cader Idris in N. Wales, & seems to have been thrown off from the main rock by an ochraceous decomposition: on that side towards the rock it is extremely porous, not unaptly resembling French burr, which is used for Mill-stones. Quartz or silex are common both in primitive rocks & gravel roads. It frequently takes place of animal or vegetable substances, forming petrifactions, or running like lava or wax into a mould, occasionally passing into the state of chalcedony, cachalon, &c. they become opaque in burning that come from Scotland but Lan. & Bristol burn transpar.





1-42

Dodecaëdral Quartz, with geometrical figures showing its passing into the Dodecaëdron with triangular faces.

Crystallized Quartz from Carrn-gorum,
Aberdeenshire.

Silex Quartzum crystallizatum.

Crystallized Quartz; Cairn Gorum Crystals.

Class 2. Earths. Order 1. Homogeneous.
Gen. 4. Silex. Spec. 1. Quartzum.

Syn. Quartz hyalin plagiedre. Haüy, v. 2. 413.
Quartz hyalin rhombifère. Haüy, v. 2. 413.

Cairn Gorum Crystals have been known for some years, and are said to have first caused the lapidaries to settle in Aberdeen, where they have been constantly employed in cutting them for seals, ring-stones, &c. They are perhaps of the oldest formation, and are found of various degrees of transparency, sometimes coloured yellow or brown. When of a deep colour they are esteemed as topazes, (Topazes are found in the Brazils, &c) and if clear and large are sold at a high price. The brown ones are also valued if clear; but when of a bad yellow or muddy brown, the lapidaries have recourse to their art, and prove them to be rock Crystals, by dissipating their colour, and giving them a transparent lustre. This specimen is remarkable for the faces of Haüy (i.e.) the little narrow face in the middle of the right hand outline, which is often more regularly

rhomboidal), being a truncation of the solid angle of the base of the pyramid; and the oblique face on the column, which is just below it, on the same outline, corresponding with the faces on the upper figure, so as to make them more distinct. This latter is on the right hand of the column in most of the crystals on this group, and has not been before noticed. The next outline of a whole crystal lying on its column (from Cairn Gorum) has this face on the column on the other side, and a face on the edge of the pyramid and column, m of Haüy; which is somewhat rare. The left-hand outline has a little hollow in one corner, enclosing some liquid. The next figure shows the water, as it is commonly called, slightly magnified; which is mostly known by a little bladder of air moving as the crystal is moved. There is something that floats in the liquid, and looks like soot, or oxide of carbon. Crystals containing water or some liquid are sold at a high price. Sowerby does not know that any substance has been observed floating in the liquid within any crystal before. The above group is in the collection of G. Laing, Esq.r of Edinburgh. The others in Sowerbys cabinet.

Cuprum arseniatum, var. amianthiformis.

Amianthiform Arseniate of Copper.

Class 3. Metals. Order 1. Homogeneous.
Gen. 4. Copper. Spec. Arseniate of Copper.
Div. 2. Imitative. Var. 2. Amianthiform.

Spec. Char. Copper combined with arsenic acid.

Syn. Amianthiform arseniate of copper. Bournon, Phil. Trans. 1801. p. 180.
N. 2. 4th species, &c. Chenevix, Phil. Trans. 1801, p. 199.

This species of Copper appears first to have been described by Count Bournon. The present variety is a curious example, and seems so well described by the above author. "This variety is composed of fibres as delicate as those of amianthus, of the flexibility of which they frequently possess a certain degree". In the present specimen they resemble the finest filaments of silk. It serves to show a variety in colour not mentioned by Count Bournon, viz. the purple hue, which more or less covers the surfaces or the points of the flexible threads. The other parts are of a lightish straw yellow. Its resemblance to a raceme of currants or a bunch of grapes made Sowerby think that each bundle was composed of fibres formed from its centre (as some of the smaller are): But on opening some of them he found an ochreous gravelly substance in the middle, from which

they diverged more or less regularly, often more dense and hard inwardly than outwardly. The more regular ones are commonly more white and satiny than the others, excepting towards the tips, and are more of the texture of rotten wood. The outsides are very tender, and easily bruised. According to the analysis of Mr. Chenevix, this species contains

Oxide of copper	54
Arsenic acid	30
Water	16
	100

Haüy mentions capillary arseniate of copper, v. 3. p. 578. and observes "that foreign mineralogists have found different regular forms of arseniate of copper, which from certain circumstances he has not yet been able to determine." The lower magnified figure shows some of the fibres or filaments of both sorts here mentioned, some of which are collapsing at their points as if they had been wetted, forming various reticulations and indentations of a purplish hue, apparently retaining that colour from being less exposed to rubbing or any other accident. This was found in Huel Gorland mine in Cornwall, from whence most of the other arseniates of copper come.

1-45

Silky amianthiform Arseniate of Copper of a botryoidal appearance.

Tab. 75.

Silex quartzum, var. arenaceum.
Sandstone.

Class 2. Earths. Order 1. Homogeneous.
Gen. 4. Silex. Spec. 1. Quartz.
Dis. 3. Amorphous. Var. 2. Granifom.
Syn. Ferruginous Sandstones. Kir. v. 1. p. 365.
Cos colorata. Linn. Syst. Nat. ed. 13. v. 3. p. 64.

Sandstones are not uncommonly impressed with the casts of shells, &c. They are little less than granules of flint, with iron more or less oxidated: the oxidation is most conspicuous in the crevices where the shell has been mixed with a little lime, or other things, giving them different tints. The shapes of many sorts of shells are found in these Stones, mostly Arcas and Anomias. The acuminated sides of the Arca on the Stone at the right hand seem accidentially formed, from the peculiar manner of its immersi=on in the mass. They are often found detached as figured, and serve to undeceive us. These Arca, as they surely are by the length of the hinge, apparently contain many denticulations or teeth, the distinguish=ing character of the genus. The singular rising in the middle of the upper shell, of about 5 pleats wide; and the corresponding cavity in the under one, is a curious character, common, with some variations, to both

these and the ~~Amor~~ Anomia, with which they have generally been confounded. The little Anomiæ at the bottom are darker, and probably contain more iron. Their structure is certainly remarkable, especially as we, in the, in the present age, have no recent shells in this part of the world resembling them. This specimen came from the Tees in large fasciculi. They crumble but little in the fracture, rather condensed, and approaching to the conchoidal, like flint: often very tough, but too heavy for building, and not of any known utility at present: they perhaps might be liable to decay as the ochraceous substance is somewhat scattered through them. They sometimes contain more or less clay.

1-55

Ochraceous Shelly Sandstone.

Tab. 76.

Ferrum sulphuratum.

Sulphate of Iron.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 7. Iron. Spec. 6. Sulphate of Iron.
Div. 1. Crystallized.

Spec. Char. Sulphuric acid combined with iron.

Syn. Vitriol martial. De Lisle, v. 1. 331.
Sulphate de fer. De Born, v. 2. 39.
Vitriol vert. Daubenton, 28.
Vitriol of iron. Kirw. v. 2. 20.
Fer sulfaté. Haüy, v. 4. 122.
Vitriolum martis. Linn. Syst. ed. 12. v. 3. 104.

Green vitriol, as it is commonly called, is found crystallized, stalactitical, or in amorphous lumps, in many parts of great Britain. This came from Hawkshead coal mine, near Glasgow. The mine had been worked for above 200 years, from the crop to the dip (as the colliers term it), that is following the descent from where it appeared on the surface, always working at the lowest part. Thus the upper parts, or pits first worked were necessarily kept free from water, and were left exposed to the external air above the coal stratum. The black clay or aluminous one, being the ceiling of the mine, absorbed the oxygen in the common air by

means of the sulphuret of iron, (which is almost imper-
=ceptibly mixed with it,) in such abundance as to expand
it, first in the form of white silky threads, merely separating
the lamina in a somewhat undulating form, but after-
=wards expanding it in such a manner, that the
whole stratum, which was but 14 inches, sometimes be-
=came a yard in thickness falling to the floor; and
the threads, from being scarcely perceptable, become
near an inch long, curling in many fanciful di-
=rections (shown in another place) It sometimes ri-
=pens or consolidates into what the workmen call na-
=tive copperas, & may possibly hold a little copper.
It is somewhat crystallized, like the green part figured
upon the clay or alumine, which is in the act of throw-
=ing out little white opaque round spots, the effect of a
further change since the specimen was in Sowerby's
possession. These probably contain less water than the
other parts. — Its transparency is 2 or 3. Kirw. This is a
very good alum ore, the sulphuric acid and the argil
being by proper means separated, and recombined
to form that substance.

Native Vitriol, or Sulphate of Iron.

Cuprum nativum; var. arborescens.

Native Copper; var. arborescent.

Tab. 77.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 7. Copper. Spec. 1. Native Copper.
Div. 1. Crystallized.

Syn. Kirw. v. 2. 128. Haüy, v. 3. 521.

Arborescent Copper differs from the dendritical, (which branches chiefly from its sides, & is mostly compressed,) in branching many ways without compression, & generally more perfect in crystallization, as it is formed among loose fragments of quartz. The crystals are 12 sided, & sometimes without a lens may be seen; at others many are accumulated and attached to each other in different directions forming the appearance of a rough stem & leaves. They often widen and form masses. The colour and lustre vary from light & bright yellowish red to bright brown-red. The lower figure came from Tonro. The upper figure is rather between dendritical & arborescent copper, but the definition is of no real consequence. The crystallizations are less perfect, and are made still less so by the green oxide covering the surface and giving it a more vegetable appearance, except that its colour is too gay for any vegetable we know. It comes from Steul Jewel in Cornwall.

Arborescent Copper, crystallized in Dodecaedrons.

Calx Fluor primitiva.

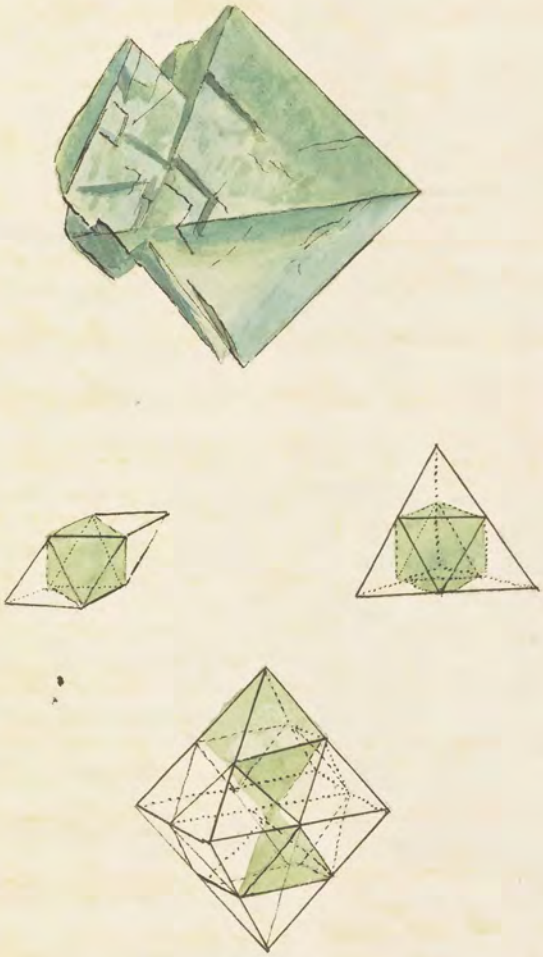
Primitive crystallized Fluate of Lime.

Class 2. Earth. Ord. 1. Homogeneous.
Gen. 1. Lime. Spec. 4. Fluate of Lime.
Div. 1. Crystallized.
Syn. . . . . Rashleigh, 1. tab. 24. f. 2.

The upper figure here represented seems very nearly allied to the green fluor in the hornstone before mentioned. This must have been a very fine specimen, it was elegantly formed among long columns of quartz, and came from the Pell mine, St. Agnes Cornwall. It is rare. It has no matrix, and appears to have been bonded to a larger mass of its own substance, the fragments of which remain with it, and serve to show that the under parts have a tendency to the octaedral figure. A remarkable circumstance belonging to this and the green part of the fluor from Beer Alston, is; that on the hot poker it gives a blue green glow nearly like itself, but lighter from its bright-ness and somewhat more blue, very nearly resembling the Chlorophane of Siberia mentioned in another place.

The lower representations are designed to show the nature of the crystallization, which at first appears as if it had a rectangular octaedron for the primitive and integrant molecule: but on examining the fracture carefully, we find signs of many forms and can produce fragments truly tetraedral and rhomboidal;

the former of which exists to form the octaedral; and (vice versa) one octaedron with four tetraëdrons forms a tetraëdron placed as in the right-hand figure. An octaëdron requires 6 octaëdrons and 8 tetraëdrons to form it as in the lowest figure. The rhomb, which might be taken for the primitive, is composed of one octaëdron and two tetraëdrons as in the left hand figure. An octaëdron is tinted in each to make it more apparent and the lowest figure has also a tetraëdron coloured. The fracture in fluor is very distinct from that of carbonate of lime, and is parallel to the faces of the octaëdron, each plate having always one hexangular face, sometimes 2, forming together a flat octaëdron, like the bottom half of the left-hand figure in (Phosphate of Lime crystallized in octaëdrons, coated with opaque white & green alternating) Perhaps, fluor fractures into more natural varieties of figures than any other mineral substance. However, as the octaëdron is always to be found in it, and is included most simply in the tetraëdron, the latter may be called the integrant molecule, and the former the primitive crystal. Sowerby does not know that the tetraëdron or rhomb has ever been obtained except by means of fracture.



Green Octaedral Fluor, with outlines of the various Natural Fragments.

Ferrum sulphureum. Tab. 79.

Sulphuret of Iron. Pyrites.

Class 3. Metals. Order 1. Homogeneous.
Gen. 7. Iron. Spec. 5. Sulphuret of Iron.
Div. 1. Crystallized.

Spec. Char. Sulphur combined with Iron.

These crystals came from Parys Mine, Anglesea, where there is great abundance in some places, heaped together like grains of sand, so small that their lustre is lost in their minuteness, much less can the cubic form be seen without a magnifying glass. The rocks of lime-stone, and those passing to regular slate, contain them of different sizes. The upper figure is from a specimen the gangue of which is between common lime-stone and slate, and contains no small quantity of the crystals. The gangue is in the more chalky parts stained a little green perhaps from some oxide of copper. The lower figure is a piece of undulated (otherwise common blue) slate, which is a durable sort if free from pyrites, as the common air decomposes the pyrites, decays the iron, and the slate becomes rotten. This will be further explained when treating of the best slate of Wales, Westmoreland, Yorks' Cornwall, &c.

Sulphuret of Iron, or Iron Pyrites in an Undulating Slate, &c.

Calx carbonata fœtida

Botryoidal Limestone with a fœtid smell.

Class 2. Earths. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 2. Carbonate of Lime.
Div. 2. Imitative. Var. Botryoidal.

Syn. Swine Stone. Kirw. v. 1. 89.
Stinkstein. Emmerl. v. 1. p. 487.
Chaux carbonatée fétide. Haüy, v. 2. p. 188.

We have exhibited the present Specimen of Limestone as a very curious one, on account of its resembling a bunch of Grapes. It seems to be formed by water passing through loose marly earth, and consists of smaller or larger globules, according to circumstances; sometimes in bundles resembling Kelton Stone, at others much larger (see the lower figure). The globules are occasionally a little hollow, and crystallized within; sometimes nearly clear, and white, when they are destitute of smell; But they are more commonly solid and brown within, having a very fœtid odour, (The fœtid variety of Lime-stone is by no means rare), easily perceived by scraping or pounding. This smell has been ascribed to bitumen, but is of a very different nature. Vauquelin considers it as sulphurated hydrogen. The colour goes off from the surface if exposed to the atmosphere; which makes it necessary to scrape it; the heat used in burning it to lime dissipates it entirely.

The colour is caused by oxide of Iron with more or less clay.
The lower figure is very interesting, as it shows the stratification while crystallizing, the darker parts making it evident.
The top of this specimen is crystallized with the acute ends of the inverse rhomb, pointing outwards, which is not unusual in this kind of concentric construction of calcareous earths. Lady Wilson gave Sowerby a specimen of this stone from Sunderland. Mr. Winch, F.L.S. one from Hartlepool Durham, and it should seem by his observations that this curious Bature may extend from Hartlepool to Sunderland all along the coast, & perhaps much further.
It is called Building Hill Stone in Sunderland.

Botroidal Sarine Stone, &c.

Carbo bituminosus.
Pit-Coal.

Class 1. Combustibles. Ord. 2. Mixed.
Gen. 6. Carbon. Spec. 1. Bituminous.

Spec. Char. Bituminous oxide of Carbon, and oxide of Carbon; mixed.

Syn. Mineral Carbon impregnated with bitumen. Kirw. 2. 51.
Bitumen Lithanthrax.* Linn. Syst. Nat. ed. 13. t. 3. p. 111.
Steinkohle. Emmert. 1. 60.
Houille. Haüy 3. 316. De Lisle 2. 590.

There are many varieties of coal in different mines, and even in the same mine. The upper figure is taken from a common Newcastle specimen, from whence a great part of England & many parts of the Continent, are supplied. It is evidently composed of two sorts of strata. The one like the remains of charred wood, or oxide of carbon. This has hitherto escaped the notice of most authors; besides the grain and appearance of wood, common in this and most other coals, it will be known by being the only part of coal that will ~~stain~~ soil the fingers. If separated, it burns like charred wood, leaving a similar ~~red~~ residuum,† it is also soft and powdery, like burned wood; breaks in a crumbling manner, and falls into small particles.✪

* Linnæus included all coals under this title, describing them as a schistose, which does not include all the specimens.

† We have reason to believe it contains no alkali.

✪ Mr. Jameson says, "this does not seem a common appearance," when he found "carbonized wood which could not be distinguished from carbonized fir." v. 2. p. 87. It is probably the smut of Mr. Kirwan.

The other part is more compact, shining, & brittle, & easily scratched with a knife. The least touch of the fingers hurts the polish. It has a somewhat splintery conchoidal fracture. seems mostly carbon mixed with bitumen. Inflames in a moderate heat, much smoke, bubbles, & melts something like pitch, & helps the binding or caking, (which is a sign of good coal) & leaves a cinder which last long, giving a strong heat. If burned long in a violent draught of air, it forms a clinker of no value; which shows it to contain some silex, perhaps, iron. Coals are not known to crystallize, but the glossy part appears to have a disposition towards it in the partings; these mostly have the same angles, forming an upright prism with rhomboidal bases, the angles of which about 84° and 96° (most mixed coals in the common large masses break through the whole stratum more or less in this form:) The middle figure is a fragment of the Newcastle coal; the completest crystal-like form ever seen. upper surface charcoaly, and it rests on a similar substance, with irregular strata beneath. Newcastle coal loses about 35 per cent. of its weight when flaming. Linn. description seems to belong more to the slaty. The lower figure is Scotch coal, which was broke through the bituminous strata, in a transverse direction: and shows the glossy fracture, with a satiny appearance, as well as the angles of partings. This bituminous stratum is commonly somewhat shaly in this sort of coal: the other part is mostly pure charcoal, & often exhibits the shape of branches compressed, & the same transverse contractions which take place in burning deal. This coal loses 25 p.c. cent. readily flames, continues its heat with little bubbling, leaves a white ash. Scotch coal having layers in contrary directions is sometimes called riband coal. Lustre of the alternate layers 3, 2, (silky & brighter) Fracture small grained, & course grained, curved, & foliated. Hardness 4 to 5. Spec. Grav. 1·259. Sowerby has a coal from Boroughstoness, varieties of which are found at Newcastle, Wiggan, &c. These are often confounded with the Box coal or Cannal Coal of Kirw. v. 2. p. 52. the true sort is now very scarce. Sowerby has specimens of ~~Lynn~~ Lynn coal, presenting hexaëdral prisms. Other coals present this figure, and also trihedral prisms. These are produced by a fracture parallel to the one of the diagonals of the base of the tetraëdral prism.

Newcastle and Scotch Coal.

Plumbum phosphatum. Tab. 82.

Phosphate of Lead

Class 3. Metals. Order 1. Homogeneous.
Gen. 14. Lead. Spec. 3. Phosphate of Lead.
Div. 1. Crystallized.

Spec. Char. Combined with Phosphoric acid.

Syn. Phosphorated Lead ore. Kirw. v. 2. 207.
Green-bleierz. Emmerl. v. 2. 394.
Braun-bleierz. Ibid. 383.
Green Lead ore. Syst. Min. Jameson.
Plomb phosphatée. Haüy, v. 3. 491.

The yellow phosphates of lead of Wanlock-head mines, Scotland, are found coating Galena in the Bellan-grain vein, from 20 to 30 fathoms below the surface, but gradually, disappear at greater depths. From this mine the specimen came, brought by G. Laing, Esq.r They are found in other parts of Great Britain. The purest phosphates seem to be of the brightest yellow, and the crystals are generally very small, being mostly hexaedral columns and their modifications. The present is in very perfect hexaedral columns, and its yellow varies in intensity, with

a greenish and brownish cast. The crystals are soft, brittle, easily scraped with a knife, & the powder (It is said to be gray by Haüy, let the colour of the mass be what it will.) corresponds with the colour of the crystal. The crystals will easily scratch carbonate of Lead. Fracture splintery and conchoidal. "Integrant molecule an irregular tetraedron. Primitive form a hexapyramidal dodecaëdron." Haüy. We find these at first by exposure to the blowpipe, turn green; then they assume a pearly colour, & afterwards become irregularly fibrous. The heat being continued, these fibres unite in a somewhat concentrating manner, forming various polygonal facets in an irregular sort of crystallization: see the left hand figure at the bottom. This substance is sometimes situated on an amorphous matrix of its own nature, or on quartz, ochraceous quartz, galena &c., as mentioned in another place.

Yellow Phosphate of Lead.

Tab. 83.

Calx nativa.

Native Lime.

Class 2. Earth.* Order 1. Homogeneous.
Gen. 1. Lime. Spec. 1. Calx nativa.

Gen. Char. Powdery or concrete, with a hot burning taste. Corrodes animal substances. Spec. grav. 2·3, Kirw. v. 1. 5. Precipitates from a solution in water, by adding corrosive sublimate, in the form of a reddish powder. Kir. v. 1. 75. Changes syrup of violets green.

Spec. Char. Uncombined.

Syn. Native lime. Kir. v. 1. 74, 75.
Pure lime. Bab. 7.
Artificial. Calx viva. Mat. Med.

Quick-lime, or Calx viva, is well known, as procured from chalk or lime-stone by means of burning in lime-kilns. In the act of burning it is deprived of an air or gas, chemically termed carbonic acid gas,† loses part of its weight, and takes up caloric, or latent heat of Dr. Black. It is then caustic with the properties as described in the generic character, changing the syrup of violets green.

* Earths are incombustible, infusible per se, spec. grav. not exceeding 4·9, and white.

† Formerly termed fixed air, discovered by Dr. Black. It is heavier than common air, forming a small or adventitious part of the atmosphere; is readily absorbed by cold water, giving it a brisk taste. As an acid, it turns vegetable blues red.

This character it retains as long as the latent heat or the effect of it lasts, which heat and principle of changing the syrup of violets green will be lost if exposed to a damp atmosphere.

The upper is artificial lime just exposed to damp air, yet capable of changing syrup of violets green, & beginning to fall to pieces. If a quantity is suddenly added, it will loose its characteristic property, some, by absorbing carbonic acid gas from the atmosphere, or the water of which the fire had deprived it in the kiln, & when dried without heat it will be nearly what it was at first. The middle figure, Calx nativa, from Bath, has qualities resembling quick lime, and changes syrup of violets green, nearly as vivid as that produced by the artificial above; The lower figure is lime taken out of a hollow nodule of flint, to which before it was broken no aperture could be seen. The contents were exposed immediately to some fresh violets pressed so as to afford 2 or 3 drops of juicy fluid, it directly changed it green. It soon lost that property, & is now a gritty chalk. External character of the Bath Lime.

Colour white
Lustre 0.
Transparency 0.
Fracture earthy.
Hardness rubs easily to powder.

It should seem that this passes out of rocks in a fermentative manner, oozing or frothing. The surface of the specimen is a little incrustated with a stalactitical substance. the inner when examined seems partly in bubbles. Dr. Morton found lime in the stones near Clifton pit North:d.*; Sir John Hill has seen it drawn out of the quarries near Bath, & calls it native lime and Gypsum Tymphaicum of the antients, saying that Theophrastus has left a record of a ship taking fire from the heating of the gypsum among some clothes, on the accidental admission of wet; & that he does not call it gypsum himself, but an earth only that the people about Tymphaea, &c called gypsum.

* Since the above written Mr. John Hailstone, Woodwardian professor of Cam.: informs me that the Calx nativa sent to Dr. Woodward by Dr. Moreton has no pretensions to be a lime.

Upper Fig: Artificial Lime,

Mid: Fig: Bath Lime,

Lowest Fig: Lime out of a hollow Flint;

Kent.

Tab. 84.

Argilla Marga.

Argillaceous Marle.

Class 1. Earth. Order 2. Mixed.
Gen. 5. Argil.* Spec. 1. Argillaceous marle.
Dio. 2. Semi-indurated.

Spec. Char. Argil & carbonate of Lime, in which the former predominates.

Syn. Marga argillacea. Waller, v. 1. 72.
Mergel. Emmerling, v. 1. 491.
La Marne. Brochant, v. 1. 569.
Argile calcarifère. Haüy, v. 4. 455.

This is represented as showing the distinguishing character, or parts, of marle, which if minutely combined, might require a chemical analysis to determine them; and may be useful to young mineralogists. Calcareous marle consists of carbonate of lime from 66 to 30 per cent. Kir. v. 1. 94. Marle properly so called consists of equal parts of clay & carbonate of lime. Argillaceous marle contains about three parts of clay, and one chalk. Mr. Andreas, in Kir. v. 1. 192. The present specimen, was given by Mr. Pilkington, F.L.S., was found about 190 feet deep, in digging a well for L.d Redesdale; now C. Bode's Esq.r, at Streatham, Surrey.

* Common clay, which may be distinguished under most combinations by what is commonly called an earthy scent.

It is of a semi-indurated toughish texture, but readily falls to pieces in a damp atmosphere. The clayey parts are evidently mixed with carbonate of Lime, and some of the Shells are little else. although they retain the original figure so well that we may distinguish some of the species. (These on breaking the mass, leave half their substance on the convex side of the matrix; & the other half in the mould.) The pearly Oyster Shells only seem to have assumed a black tinge. The other pearly shell, perhaps Arca Nucleus, Linn. Gmel. v. 1. 3314. retains its original lustre, its gluten being less easy to decompose. (see Mr. Hatchett's ingenious paper in Phil. Trans. for 1798.)

There are other pearly shells in the mass, but not easy to be made out. The clayey-looking part does not effervesce with vinegar, neither do the pearly shells. The chalky ones readily do.

Marles depending on their proportions of Lime, clay (Clay must be understood as a mixture here of argil, silex, and Iron.) or sand, are used as manures, each sort being adapted to the nature of the Land they are applied to.

One kind of Marle has lately been found to be a useful stucco, when properly prepared.

1-14

Marle, with the decomposing Shells almost specifically distinct; forming chalky Carbonate of Lime.

Cuprum dendriticum.
Dendritical Copper.

Tab. 85.

Class 3. Metals. Ord. 1. Ductile.
Gen. 4. Copper. Spec. 1. Native.
Dis. 2. Imitative.

Syn. Cuprum nativum. Walter, v. 274. Linn. Syst. ed. 12. v. 3. 143.
Gediegen kupfer. Emmerling, v. 2. 206.
Cuivre natif. DeLisle, v. 3. 305. Haüy, v. 3. 518.
Native copper. Kirwan, v. 2. 128.

Not uncommon at the Lizard & other places in Cornwall, in the crevices of quartzose rocks, or in serpentine, and is occasionally found in N. Wales, &c. It accommodates itself in all directions to the smallest openings, ramifying, or inosculating, as in the specimen figured, or forming network. It is generally so compressed as to have the impression of the stone on the surface, giving breadth to the extremities, like foliage, which is often helped by the tendency of the metal to crystallize. This it always partly does, but in so confused a way that it can only be understood by comparison with such specimens as have had more room to crystallize. This will be readily understood by the figure called Arborescent Copper. The fresh fracture is very reddish, mostly brighter and lighter in colour than the outside which is often stained. It is however sometimes found so pure that it changes but little, & the fracture will hardly show a difference of colour if carefully kept. Hardness 6-8, Kirw. Steel cuts it readily whence it is made into plates for engraving on. It is soluble in acids. It forms a compound metal with Tin and Zinc, called brass. It is readily drawn into wire, which is very tough and durable.
A wire one tenth of an inch in diam.r will sustain 299½ pounds weight.

1-17

Native Dendritical Copper.

Tab. 86.

Stannum oxygenizatum.

Oxygenized Tin

Cls. 3. Metals. Order 1. Ductile.
Gen. 8. Tin. Spec. 2. Native oxide.
Div. 1. Crystallized.

Gen. Char. Nearly as white as Silver, malleable, ductile, and sonorous in a small degree, flexible, but with a crackling noise. Spec. grav. only 7·063 to 7·331. Smell unpleasant. Fuses at 410° Fahrenh. Not soluble in nitric acid.

Spec. Char. Tin united with oxygen.

Syn. Common Tin Stone, Kir. v. 2. 197.
Zinnstein. Emmerling, v. 2. 421.
Tain oxyde. Haüy, v. 4. 137.
Stannum crystallinum. Linn. Syst. ed. 12, v. 3. 130.

Tin, although universally known in the metallic state as obtained from its ore, would never be recognizable without experience in the crystallized oxide, from which it is chiefly procured. This crystal was once thought by the Cornish miners, to be destitute of metal. The tin mines of Cornwall are the most famous in the world and were very early known. The Phoenicians procured this metal from thence. The Cornish tin ores are said to be the most pure, as they contain less Iron and arsenic than those of Bohemia, Saxony, &c. The crystals are mostly confused; specimens however are sometimes found (and preserved to gratify the curious) which are very distinct and beautiful. They resemble bottle glass; are mostly of a Black hue, approaching a brownish brown lustre; sometimes brighter, and with a

fiery sparkling, varying to red, gray, or whitish. The crystals are the cubic or octaëdral modifications: the perfect cube has it is believed never been found. The octaëdron, is perfect in the Honble. Grenville's collection. Sowerby has one nearly so. They often press against each other, forming ma=clas, &c. This ore is found varying, sometimes amor=phous, in the quartzose, decayed granite, or growan, hillocks, and other rocks: also in streams, and is then called stream tin. It occurs also in pebbles, and sandy particles. A rare species, called wood tin, or tin hæmatites; also another called tooth tin, are found in different parts of Cornwall. There is very little tin in Devonshire, and none in any other county of Great Britain.

1-18

Oxyd of Tin Crystallized

Plumbum Galena.

Sulphure of Lead; Galena.

Tab. 87

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 5. Lead. Spec. 7. Sulphate of Lead.
Dio. 1. Crystallized.

Syn. Galène, Sulphure de plomb. De Born, v. 2. 354.
Bleiglanz. Emmerl. v. 2. 369.
Sulphuret of Lead. Bab. 166.
Lead mineralized by sulphur, compact galena. Kirw. v. 2. 216.
Plomb sulphuré. Haüy, v. 3. 436. 7.
Plumbum galena. Linn. Syst. ed. 12. v. 3. 133.

This is the commonest lead ore, is found in Derbyshire Cumber: & Yorkshire &c. in Wales, Scotland & Cornwall. It seldom occurs truly amorphous. The present specimen came from Derby: and is valuable having the primitive cubic crystals so distinct. They are somewhat brighter than manufactured Lead, either outwardly or in the fracture, which rather more resembles manufactured lead fresh cut. Some varieties are brighter than others; which is said to be owing to their containing more Silver. Some varieties have a diverging striated fracture. This one holds Lead in the metallic state. Before the blowpipe on charcoal it decrepitates, but melts easily with a sulphureous smell, part sinking into the charcoal. If alternately heated and cooled, it will at last vanish, and leave its Silver, if it contains any. Berg. 493. — Spec. Grav. 7,587. Brisson.

1-24

Sulphure of Lead, Galæna, or common Lead Ore, in Cubes. Sulphate of Barites, &c.

Calx sulphurata; var. plumosa.

Sulphate of Lime; var. plumose.

Class 2. Earth. Ord. 1. Homogeneous.
Gen. 1. Lime. Spec. 5. Sulphate of Lime.
Dis. 2. Imitative; var. plumose.

Syn. Sulphate of Lime forming snow white incrustation, &c. Bab. 29. CCXVI, a, l.
Chaux sulfatée niveforme (A variety found at Montmartre.) Haüy, 2. 279.

The upper figure is a curious variety of sulphate of lime, or gypsum, from Matlock. It should seem that sulphur of iron or pyrites, by exposure to damp, decomposes; the sulphur combining with oxygen forms sulphuric acid, which comes in contact with the lime in the rock, and so forming gypsum, oozes out in fanciful forms; or, in other words, readily produces gypsum more or less crystallized. It is continually forming in many parts of England. Ld Altamont gave lately some nodules of pyrites, in which gypsum is formed, from a well just dug in Cambridge. It is continually crystallizing from the sulphur of pyrites & oyster shells at Shotover Hill, near Oxford. The Lower figure is on a piece of Lime Stone with a fœtid odour, called stinkstone, the gypsum spreading in a very peculiar manner on the surface in patches. This specimen came from the neigh^d of Durham. Sent by the Revd John Flaxman.

Gypsum Plumosum, or Feathery Gypsum, or Uncalcined Plaister of Paris.

Argentum capillaceum.

Capilary Silver.

Tab. 89.

Class 3. Metals. Ord. 1. Ductile.
Gen. Silver. Spec. 1. Native Silver.
Div. 2. Imitative.

Gen. Char. The whitest of all known metals, very malleable, and sonorous; specific gravity before hammering, 10·474; after, 10·510. Dissolves in nitric acid readily, and may be precipitated from it by copper, iron, or zinc. Remains in fusion at 28° of Wedgewood; but requires a greater heat to fuse it.

Spec. Char. Ductile with but a small proportion of alloy.

Syn. Argentum nativum. Walter, v. 2. 328. Linn. Syst. ed. 12. v. 3. 148.
Native Silver. Kirwan, v. 2. 108. Bab. 146.
Gediegen silber. Emmerling, v. 2. 153.
Argent natif. Hauy, v. 3. 384.

This Specimen came from Gwinear, about 7 miles from St. Michael's Mount Cornwall soon after the discovery of Native silver in the Herland copper mine in 1799. according to the Rev.d Malachi Hitchins account, in Phil. Trans. for 1801, page 169." The lode in which it occurs is one of those cross courses which intersect and derange the copper lodes, and are consequently of a more recent formation. No ores of silver were observable in this lode till at the depth of 110 fathoms from the surface, and at the further depth of

 32 fathoms they disappeared. The richest mass of Silver ore was found at the depth of 2 fathoms above the level at which it disappeared. About 108 tons of it are said to have raised. The Silver ore, strictly speaking, is a mixture of galena, native bismuth, gray cobalt ore, vitreous silver ore, and native silver." This specimen seems to be galena decomposing and protracting the silver; itself remaining of a cinereous appearance, losing its natural brilliancy. There are also some pyrites and bits of quartz. The silver protruded is nearly pure, and has been (from its curling appearance) compared by the people of Penzance to the scrapings of silver spoons. The silver for coin and manufacturing is alloyed with copper, which does not affect the whiteness, and is not easily detected, unless in too great proportion, when it may sometime be tasted. It may be made very thin as leaf silver, 1 grain thus formed measuring more than 61 sq. in. It is often used to plate over copper or iron, & wire so made serves for musical instruments, &c. a wire 1 tenth of an inch in diam. will support 270 lbs weight. Silver being dissolved in nitric acid and precipitated with mercury, resembles a tree, & is then called Arbor Diana. - If precipitated from the nitric acid by lime water, the precipitate dried and washed with a solution of pure ammoniac, has a dangerous fulminating property; & on the slightest touch, or friction, will explode most violently, exceeding gunpowder. The nitrate of Silver stains animal substances a deep black, & has been used to blacken hair; but it is extremely dangerous, owing to its corrosive property.

1-16

Native Silver in its Ore, Cornwall.

Cuprum arseniatum. Tab. 90.

Arseniate of Copper.

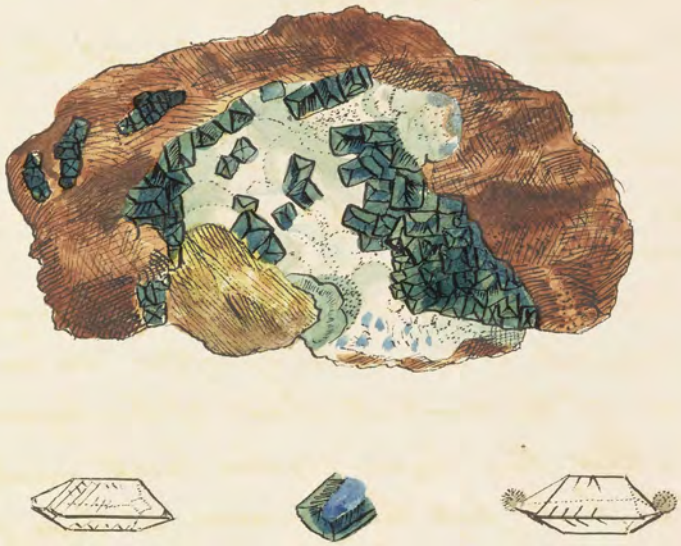
Class 3. Metals. Ord. 1. Homogeneous.
Gen. 4. Copper. Spec. 9. Arseniate of Copper.
Div. 1. Crystallized.

Var. The solid angles of the mutual base of the two pyramids truncated.

Spec. Char. Arsenic acid combined with copper.

Syn. Phil. Trans. for 1801, p. 169.

This is not mentioned by Count Bournon. among the clusters of grass green crystals of arseniate of copper, we mostly find some with the corner of the mutual base of the pyramids more or less rounded. In this they form regular facets, making it a 12-sided crystal. The facets pass the common base at right angles cutting off the 4 corners: thus the mutual base is an octaedral plane, at right angles with the 4 corners of the double pyramids. They are somewhat uneven, and show evident signs of the want of a few molecules to fill up their interstices. The crystals in general seem to have been disturbed or interrupted, & show markings on their surfaces. the left hand fig. is in Sowerbys possession, showing the sides of the mutual base somewhat rounding. The broken crystal in the middle, to show the blue within, was most conspicuously so, & is figured of the natural size, being larger than usual: the other two are slightly magnified. We have since met with one $\frac{5}{8}$ of an inch long.



Green Arseniate of Copper, in Octaëdrons, with the solid Angles of the mutual Bases of the Pyramids truncated.

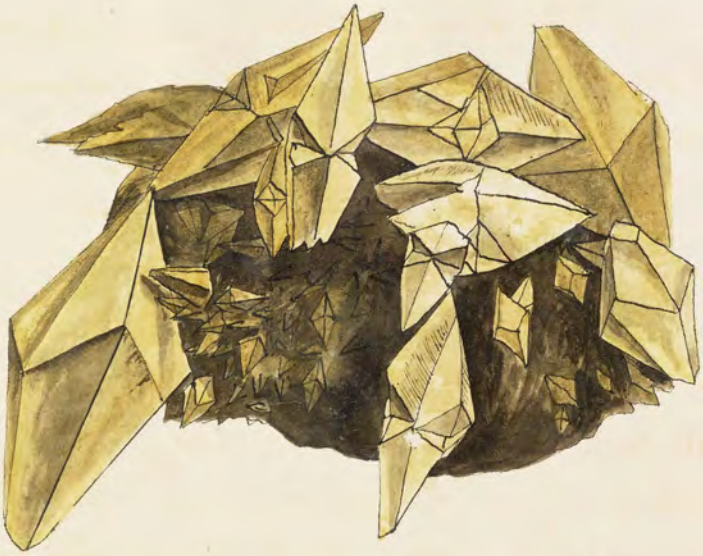
Calx carbonata, var. metastatica.
Carbonate of Lime, var. metastatic.

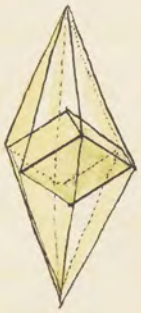
Tab. 91.

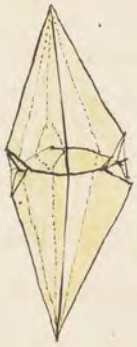
Class 2. Earths. Order 1. Homogeneous
Gen. 1. Lime. Spec. 2. Carbonate of Lime.
Div. 1. Crystallized. Var. Metastatic.

Syn. Dent de cochon. De Lisle, tab. 1. p. 530.
Chaux carbonatee metastatique. $\frac{2}{r}$D Hüüy, v. 2. p. 134.

This form or variety of crystallization of carbonate of lime is perhaps one of the most common, in England it is called Dog's tooth spar, and in France Dent de cochon or Swine's tooth. It is of various sizes and colours, &c. in Derbyshire, some show good examples of the primitive rhomb, being clear & differing very little from the true Iceland crystal, which is reckoned the most pellucid, The left hand lower figure shows the normal construction, the edges of the opposite pyramids meeting on the edges of the primitive rhomb, when the obtuse ends are opposite to the each apex, (The metastatic is formed by an addition of laminæ, formed of rhomboidal molecules upon the faces of the primitive rhomb, each plate decreasing in width twice its thickness, this is explained in another plate) the more acute angles forming 3 principal ones & the obtuse 3 less distinct: thus each pyramid has 6 sides, the acute & obtuse meeting in alternate order at the common base. The right hand figure represents 2 pyramids of the same, transversely cut through the middle, showing a plane of 12 sides, & turned on the axis till the meet each other in an opposite direction, called macling. they often seem to be 2 crystals passing into each other. This is formed on a gangue or lump of manganese, or black wad as miners call it, which tinges the crystals dirty.







A Group of Calcarious Crystals, or Pointed Dog's-tooth Spar, on a Gange of Manganese; showing the Macles, &c.

Ferrum suboxygenizatum.
Magnetic Iron Ore.

Class 3. Metals. Order 1. Homogeneous.
Gen. 6. Iron. Spec. 2. Magnetic.
Div. 1. Crystallized.

Spec. Char. Iron in combination with but a small portion of oxygen.*

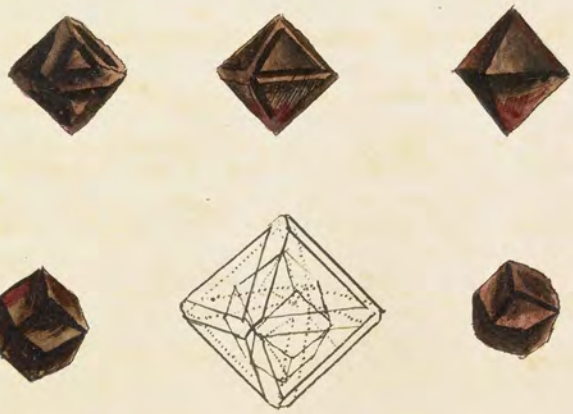
Syn. Iron in a calcined state mineralized by pure air.
Kirw. 2. 157.
Magnetischer Eisenstein. Emmerl. 2. 278.
Fer oxydulé. Haüy 4. p. 10
Ferrum tessulare. Linn. ed. 12. t. 3. p. 136.

Sowerby discovered this curious crystallization in a pyritaceous copper ore, brought from near Tavistock. by Mr. John Taylor jun.

The crystals are dispersed through the ~~air~~ ore in tolerable abundance; but being small, do not readily distinguish themselves to the unassisted eye: with a lens, however they are very satisfactorily seen, with the variety of modifications here figured, & sometimes, by breaking them, we find them curiously casing each other 2 or 3 times. They are most readily attracted by the magnet, and will support a part of the gangue of pyrites that may chance to be attached to them, of 8 or 10 times their own bulk. The gangue is said to be rich in copper, and is commonly of a bright and

* 15 to 24 per cent. Kirw. vol. 2. 158.

pale golden colour, sometimes with a greenish hue, and often iridescent. Sowerby does not know that this crystallized variety of magnetic iron ore has been observed in Gt. Britain before. Dr. Badham gave him a fine octaëdron of the Swedish sort, which is above ½ an inch in diamr. but this is not more strongly attracted by the magnet. It is coated with mica, and within, is of a more or less deep-brown red, sometimes tinges they approach to steel gray & black, partly shining, & metallic. Fracture uneven, somewhat earthy. The crystals are arranged in convenient order, to see the additions that assist in modifying the different crystallizations (viz.) The upper figure on the right hand exhibits the regular octaëdron, the faces of which by the addition of the lamina of superposition, or superior coating, form long six sided facets, which are those of the dodecaëdron with 8 triangular faces parallel to those of the octaëdron, see the middle figure. These are the nearest approach we have seen to the octaëdron in our specimens; with more laminæ, it keeps the same form which is shown, but with smaller triangular facets in the left hand figure and the right-hand lower figure. In the lower figure on the left hand the laminæ have advanced so far as to form the complete rhomboidal dodecaëdron. The geometrical outline shows this manner of casing over each other; but we must correct the dodecaëdron in the centre for the octaëdron as upon further examination since the engraving.



1-54

Magnetic Iron, Ore in Octaédrons, &c. in Copper Pyrites.

Cuprum carbonatum, var. byssoides.

Byssus-like Carbonate of Copper.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 4. Copper. Spec. 3. Carbonate of Copper.
Div. 2. Imitative. Var. 8. Byssus-like.

Spec. Char. Copper combined with carbonic acid.

Syn. Green Malachite. Rashleigh, fasc. 1. tab. 7. f. 6.
Cuivre Carbonate vert soyeuse. Haüy 3. 573.
Malachit. Emmerl. C. 2. p. 253.

Malachite copper ore, similar to this, has been found plentiful at Llandidno, in Denby.[c] it appears more like a vegetable production, than mineral, velvety. Appr: surface very tender & bruises on the slightest touch, turning white. The sides become more or less white when exposed to the air, but first broken a satiny green, of fine thready radii, often closely compacted in stratified order coat over coat, like an onion. found from a light to a dark green; sometimes the surface is tinged with red passing into crimson. Its form is generally in protuberating knobs or mamillæ. Malachites though well known in many parts of England have been generally esteemed as foreign productions: Dr. Babington says the harder sort has been found at Helstone, & the Landsend S. Wales, & Yorkshire, we have it from Wheal Unity, Corn.[c] The softer sort is not uncommon among copper ores. Dr. Bridout, got one at Dodington mine Somersetshire. They are said to contain from 66 to 75 per cent. copper, 19·4 carbonic acid, and 5·6 water, and sometimes a little arsenic. Hardness, 5-7. Klim. Spec. Grav. 3·5 to 3·994.

1047

Green Byssus-like or Soft Hæmatitic Carbonate of Copper, &c.

Tab. 94.

Calx carbonata primitiva, var.

Primitive Carbonate of Lime, var.

Class 2. Earth. Ord. 1. Homogeneous.
Gen. 1 Lime. Spec. 2. Carbonate of lime.
Var. Crystal primitive, with secondary faces parallel to both those of the equiaxed and metastatic.

This curious crystal is sometimes found at Castle-Town in Derby-shire. Its gangue is generally a bituminous limestone. It is a little milky on the outside, & roughish; those edges excepted which are rounded; see left hand fig. The right hand fig. has broad faces leading to the equiaxed crystal, which faces are as it were polished, & in the middle is a longitudinal line showing the edge of the rudiments, consequently the lamina of superposition: see the upper part of the right-hand fig. There are also rough faces leading towards the metastatic crystal: see the lower part of the right-hand fig. The little black spots are drops of mineral pitch, which mostly accompany these varieties. They have generally been termed primitive crystals, without further consideration. In an arranged collection they may be placed near to the primitive.

1-20

Carbonate of Lime in Rombs, the edges of which show the facets leading to the inverse, with other variations.

Calx Fluor primitiva.

Primitive crystallized Fluate of Lime; or Fluor*

Class 2. Earth. Ord. 1. Homogeneous.
Gen. 1. Lime. Spec. 3. Fluate of Lime.
Div. 1. Crystallized.

Syn. Chaux fluatée primitive. De Lisle, t. 2. p. 15.
Haüy, v. 2. 249. t. 31. f. 74.
Rashleigh v. 1. t. 24. f. 1.

Octaëdral fluor is rare, as observed in another place. The upper figure is from a specimen found at Bur Ashton, in Devonshire. Sowerby has never seen any of an opaque white but from that place. A white is an addition to the variety of the specimen, the crystals here are alternately opaque white and transparent green, being as it were cased upon one another, 5, 6, or more times. The transparent kind gives the usual vivid glow when laid upon a hot poker, soon crackling & flying away. The white part does neither, and will remain as a defence to the next transparent part, until a stronger heat bursts it. The matrix is commonly hornstone

* Perhaps it is merely a carbonate of lime only.

in apparently broad strata, next to a sandy one on the side opposite to the fluor; with considerable hollows, seemingly the impressions of some large confused crystallization that had been in the neat strata. This Lornestone, has sometimes apparently very large green octaëdral fluor on it, covered with quartz crystals & some varieties of octaëdral pyrites. The irregular fracture of the former gives the matrix an odd appearance, somewhat resembling the ground plan of a fortification, & not unlike what is called fortification agate found on the Scottish coast. The figure at the top of the plate shows the octaëdron & its cases. The lower figure is octaëdral fluor, from Aberdeenshire. (Jameson does not observe any thing more than that fluor has been found in Aberdeenshire had he observed any octaëdrons he would no doubt have mentioned it) They are of a dark purple, but do not detach so freely as the above: they are lighter purple or greenish on the inside & are heaped confusedly in a stratum of calcareous spar & earth. The figures at the bottom are octaëdrons lying on one of the faces. To show that the fracture which is parallel to the face gives a hexangular form, as exhibited at the left hand figure, and will account for the hexaëdral remains of the crystal in the figure. The more triangular fractures are nearer the primitive faces.

1-26

Fluate of Lime, crystallized in Octaëdrons, coated with opaque White and Green alternating.

Ferrum sulphuratum. Tab. 96.

Silky filamentous Sulphate of Iron.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 7. Iron. Spec. 6. Sulphate of Iron.
Div. 2. Imitative. Var. White Silky.

In another place the beginning of this white silky substance is shown by means of common moist air decomposing the pyrites, which is held in the black clay in such abundance in this specimen, as to separate & divide it so confusedly, that it is only recognizable by the little thin flakes, which still give out small fibrous particles if in a damp place. The green crystallized parts in this specimen are also forming into white woolly fibres. Whitby in Yorkshire, has long been famous for its alum works. Sowerby has specimens of alum ore from Mr. Baker's Boulby works. It is a more compact ore than that from Glasgow. a specimen came from Skowbrow Yorks, among which a baked piece had some of the silky filaments remaining. Alum has not been discovered native in England. It is said to be found abroad in octaedral crystals which is the form of the artificial ones. Sowerby has a fine specimen from Mr. Bakers alum works; also some beautiful little crystals formed by agitation in a wine glass, showing the lesser octaedrons within the larger, and some curious modifications. The crystallized specimen from Scotland has a prism.

Sulphate of Iron, or Vitriol of Iron, Amianthiform, &c.

Tab. 97.

Cupreum arseniatum

Arseniate of Copper.

Class 3. Metals. Ord. 1. Homogeneous.
Gen. 4. Copper. Spec. 9 Arseniate of Copper.
Div. 1. Crystallized.

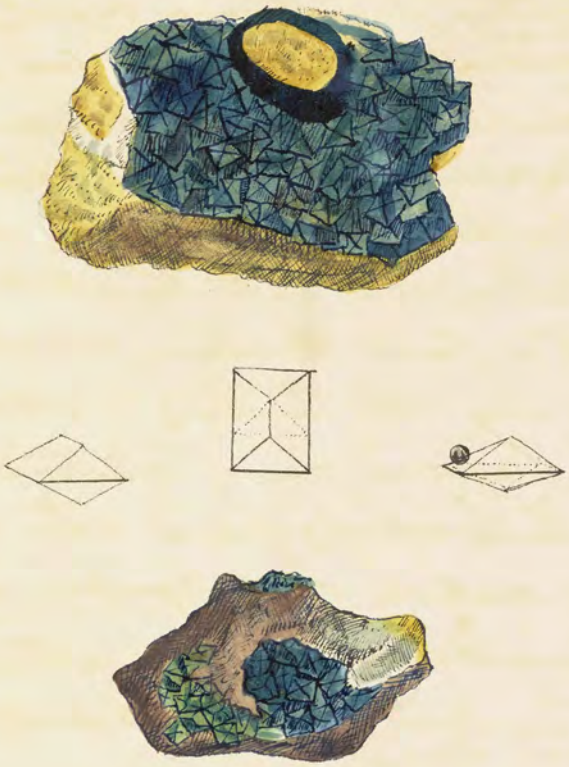
Spec. Char. Arsenic acid combined with copper.

Syn. Philos. Trans. for 1801, p. 169.

Chenevix & Count Bournon give the best account of the arseniates of copper. They are found at Phel Gorland mine Cornwall. The simplest, variety, according to the Count, is the obtuse octaëdron, which has, in each of its pyramids, two opposite planes more inclined than the other two; which gives a parallelogrammic form to their common base. The two planes which are less inclined meet at the apex in an angle of 115° and at the base in one of 65°. The faces are sometimes smooth, mostly bright, and occasionally show signs of the angles of the tetraëdron, or have striæ parallel to their edges. The 4 planes terminate in one point; but more commonly the apex is formed into a ridge, the octaëdron being lengthened parallel to the less inclined planes. The base is near a square. The first figure seems to be rare; those with the ridge are more common, particularly such as are further lengthened, passing from the right hand figure to the left. (The Count only mentions two varieties) The gangue is an ochraceous quartz with some copper, & often approaches white is called pitch copper.

The right hand figure has a little green globule of a waxy appearance. Such are sometimes abundantly scattered over over the octaedral crystals, & appear to be carbonate of copper, or malachite. It is either of a beautiful deepish azure blue with a greenish cast, exactly resembling pure Roman vitriol, or artificial sulphate of copper somewhat opaque, or of a fine green; resembling an emerald. Such are most transparent & sometimes vary being lighter coloured. These are frequently blue within, as the fracture readily shows. We shall now consider the present specimens chemically, with the assistance of Mr. Chenevix, who as well as Count Bournon, remarks the rarity of this substance in any other country; it appears that Haüy has only seen the hexaedral variety of arseniate of copper from Cornwall, in the hands of a friend when he was about his very ingenious work on crystallography. in another part some of the varieties are described. Mr. Chenevix gives the following analysis, found to contain

Oxide of Copper	49
Arsenic acid	14
Water	35
	98



1-31

Blue and Green Arseniate of Copper, crystallized in obtuse Octaëdrons.

Ferrum argillaceum.
Argillaceous Oxide of Iron.

Class 3. Metals. Order 2. Mixed.
Gen. 1. Iron. Spec. 1. Argillaceous.
Div. 1. Imitative.

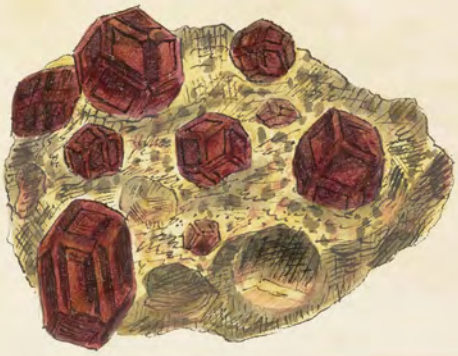
These seem common in marly and gravelly land, and are abundant at Shotover hill & its neighbourhood, where they are situated so as to assist in forming the fine yellow ochre of so great value as a pigment. They vary extremely in their shape, sometimes branching like a stag's horn, or a branch of a tree, & have been taken for such petrified. They are often coated concentrically, imitating as it were, the Medulla, Liber, Cortex and Cuticle. It may seem that the moisture passing through loosish marl has been impregnated with the oxide of iron, and periodically drying, leaves the marl and oxide of iron concentrated; which forms the coating, according to the looseness of the earth. They sometimes concentrate to a ball, but at other times have only 1 or 2 coatings.

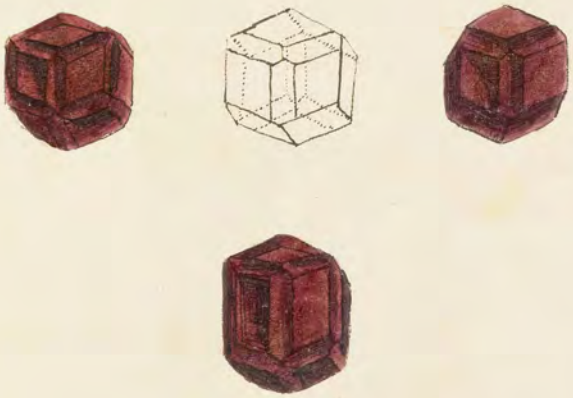
The upper figure is from Charlton in Kent; and had the remains of a shell of the Turbo kind in it. The inside of the screw is covered with minute crystals of carbonate of lime: There are other impressions of shells about it. The left hand figure has the form of a pebble with a lightish ferruginous ochre on the inside, and a dark crust. The right hand figure had loose pieces of ochre in it, of different colours, pinkish, &c., and they sometimes have wet marl and water in them. Such are called Enhydros by Sir J. Hill. The specimen came from Mousehold Heath near Norwich.

Iron stone, or oxide of Iron, forming ochry Geods.
Charlton

Tab. 99.

Garnets in a lighter granate gangue with the edges more deeply truncated on the 6 opposite edges, see the right hand and middle figure, making an 18-sided crystal. The left hand figure shows the truncation equally deep of a 36-sided figure. The lower figure forms a prism by 6 sides being elongated. These varieties are more or less distinct in the gangue above.





Garnets with 18 and 24 Faces, &c.

Ferrum sulphureum. Tab. 100.

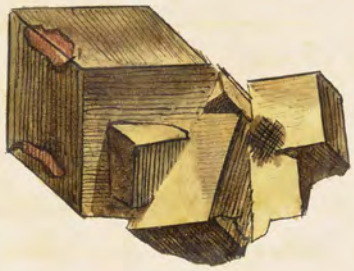
Sulphuret of Iron. Pyrites.

Class 3. Metals. Order 1. Homogaeous.
Gen. 7. Iron. Spec. 5. Sulphuret of Iron.
Div. 1. Crystallized.

Syn. Martial Pyrites. Kir. v. 2. 76.
Pyrites Martiales. Marcasites. De Lisle, v. 3. 208.
Schwefel kies. Emmerl. v. 2. 289.
Fer sulfuré. Haüy, v. 4. 65.

The upper figure is from Cornwall.

This substance is very universal, and not rarely occurs crystallized. It is perhaps as often found in the cubic or primitive form as any thing we know of, especially among the Schistose Rocks in Wales, Scotland Cornwall, and Ireland, on what Dr. Babington denominates Calp, vulgarly called Irish Diamonds. This sort was formerly used for making Buttons, and was in fashion as Jewellery, or Ladies ornaments about half a century ago being cut and polished by the Lapidaries, often to the destruction of the natural crystal. It is often found amongst coals, &c. It forms many varieties of crystallization. The upper figure shows a group of ~~crystals~~ cubes: The larger one appears somewhat laminated in the structure, and is nearly covered as it were with a thin case. They are often quite smooth, but are more frequently found with straight lines or stria on the faces, alternating with the faces next to each other, but agreeing with the opposite sides or faces. The cubes are often larger than those figured. Under the blow pipe the odour of sulphur is very sensible, and a magnetical oxide of Iron is produced. It scintillates with steel. The lower figure from Redruth, in Cornwall, with little cubes, piled like clubs, and somewhat varying in colour, perhaps contains a little more copper. Mr. Kirwan says a small portion of copper is always present in pyrites. The upper part being paler is a sort of indication of its holding most Iron. Spec. Grav. 4,1006 — 4,7491.



Sulphuret of Iron, or Iron Pyrites, in Cubes.

Tab. 101.

Upper and Middle Figure.

Soda muriata.

Muriate of Soda, or Common Salt.

Class 1. Inflammables. Ord. 2. Mixed.
Gen. 4. Soda. Spec. 2. Muriate of Soda.
Div. 1. Crystallized.

Gen. Char. Soda in combination.
Spec. Char. Soda combined with muriatic acid.
Syn. Common Salt. Kirw. v. 2. 31.
Common salt, sea salt. Bab. 14.
Stein Saltz. Emmerl. v. 2. 19.
Soude muriatée. Haüy, v. 2. 356.
Muria montana. Linn. Syst. ed. 12 v. 3. 98.

Found in abundance at Northwich in Cheshire, where it constitutes very solid strata, more or less mixed with common clay, giving it a dirty hue or with yellowish or red calx of iron. Its large square crystals are often so transparent and clean as to appear uncontaminated. The miners leave pillars of it to support the roof; looking very brilliant when lights are displayed to show it. The middle figure shows the fracture to be cubic, and also some clear pieces lying among the coloured mind. Salt in sufficient quantity preserves animal substances from putrefaction, but too little is said to promote it. Lustre 2 or 3, glassy. Transparency 2, 3, or 4. Hardness 4, 5, or 8. Spec. grav. 2, 143. Brisson. Soluble in little less than 3 times its weight of water, at the temperature of 60. Kirw. Refraction single. Salt in the artificial way of preparing it, if crystallized

hastily for use, has the centres of the cubes concave, or depressed, step by step from the edges, forming a curious figure. This is not uncommon in what is called rock salt, which is often preferred to basket salt; so called from being sold in fine grains, and prepared in conical baskets. Common salt is also used for glazing common earthen ware. 100 parts of this salt contain 35 of soda, and nearly 40 of muriatic acid, the rest being water. Kirw. 2. 33. Soda is an ingredient first procured from common salt. It is otherwise procured from marine plants. Soda is not found native in Great Britain. It is useful in making glass, & has lately been much used in washing. Too much rots the linen, and even to act as Hercules's poisoned shirt, particularly to Infants.

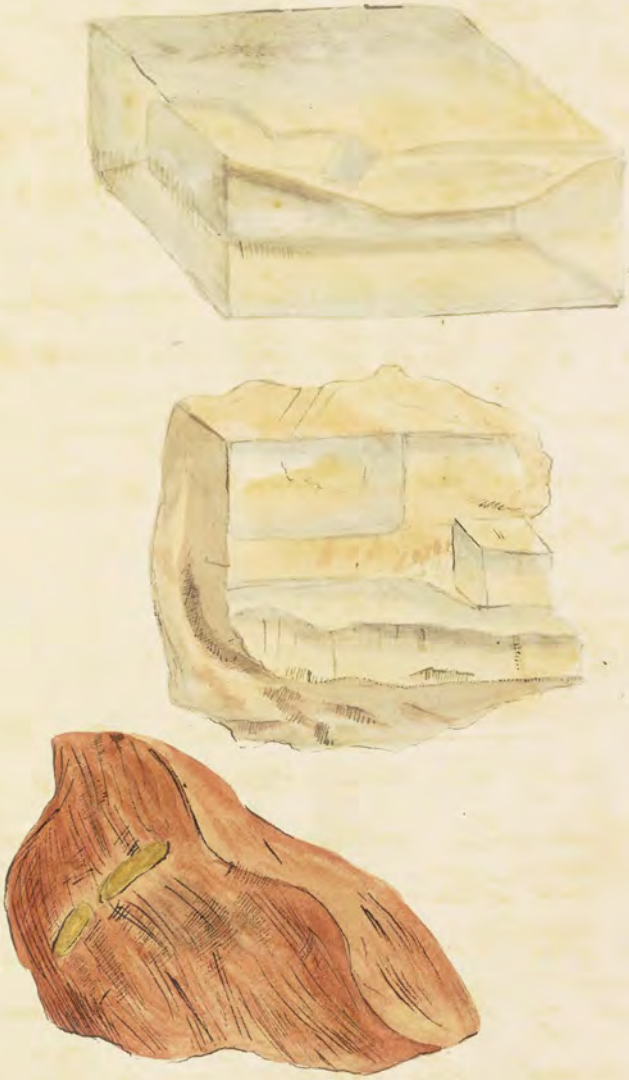
Lower Figure.

Soda fibrosa.

Fibrous Muriate of Soda.

Dio. 2. Imitative

Fibrous salt may be found of different shades of white red, or brown, depending either on common clay, or on oxide of iron. This specimen has a piece or two of common clay in the centre. Its fibrous part is coloured by a red oxide of iron. This sort of specimen has been compared to wood, the curvature of the fibres and the fracture corresponding to that fanciful idea. Some have thought that the red mind here figured resembled muscular fibres.



1-22

Native Salt, Rock Salt, or Muriate of Soda.

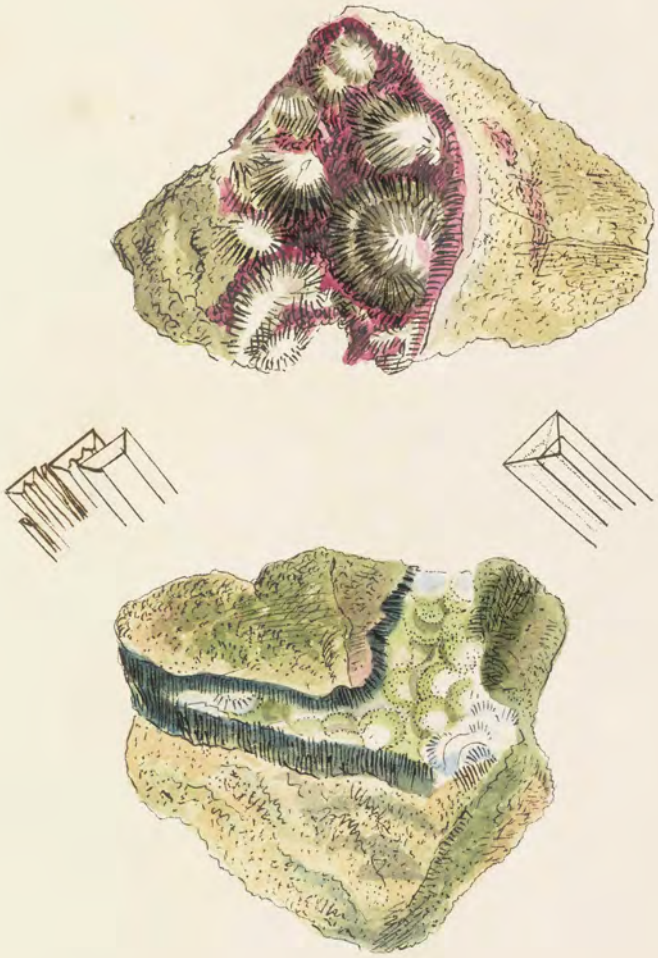
Tab. 102.

Argilla hydrata.

Hydrate of Argill, or Hydrargillite.

Class 2. Earths. Ord. 1. Homogeneous.
Gen. 1. Argill. Spec. 2. Hydrate.

The upper figure is from Cornwall. This is in looser radii than those from Barnstaple, but the Crystal the same, but shows more of the primitive face. (viz) the flat side of the column, as that shows only one primitive face at the apex. the crystals were too small to be measured. We retain Mr. Days name of Hydrar.t altho' Mr. Gregor believes there is an acid contained in it, but knows not what sort or whether essential to the mineral. It is formed in the hollows of the rock, with Quartz coloured with red oxide of Iron more or less Tracking in mammillæ about them, perhaps mixed w.th Oxide of Copper. On part of the gangue there appears Oxide of Uranite: see tab. 131. besides a little Oxide of Lead, Lime, & Silica, & a metallic substance differing from Uranium. Some have a cotton appearance. Some pearly. The Matrix of some have whitish Quartz mingled with Mica very soft, such as the Cornish Apatite is generally found in.



Hydrargillite from Cornwall.

Tab. 103

Of the indurated Bitumens, one of the first we met with was included in coarse, somewhat earthy, elastic Bitumen, and much represented in form of a green flint, with fractures not unlike those of common flints. It was very brave, of a dark olive green, & was closely surrounded by the other bitumen, as if it had been the fragment of a larger piece preceding in formation the earthy sort. We have since found another specimen of a similar nature with a black outside - see the bottom figure and also a small Stalactite or lengthened drop. The smaller fractures in these show transmitted lights or illuminations of a warm yellow colour. Thus it should appear that an accumulation of this yellow light, mixed with the black make its hue green. probably the colours depend on different degrees of oxygenizement of Iron. These figures may be a little too gay. According to the best chemists, Bitumen is formed principally of Hydrogen {combined with but a small portion of Calor} with more or less Oxide of Carbon, Oxide of Iron, and other incidental substances.

Indurated soft elastic Bitumen, of an Olive Green Colour.

Tab. 104.

Hydrogen Bitumen.

Elastic Bitumen or Fossil Caout-chou.

Class 1. Combustibles. Order 1. Homogeneous.

Gen. 1. Hydrogen.* Spec. 1. Bitumen.

*{Unknown in its pure state, unless as the softest & purest Bitumen.}

Gen. Char. Inflammable, easily converted into gas by calor. Forms water by combustion with oxygen gas.

Syn. Elastic Bitumen. Hatchett in Linn. Trans. v. 4. 146.

Spec. Char. Nearly pure, fœtid not easily volatile.

Bitume élastique. Haüy, v. 3. 313.
Elastic Bitumen. Schmeisser, v. 1. 290.
Mineral Caoutchou. Kirw. v. 2. 48.
Elastisches erdpech. Karsten, 42.
Caoutchou fossile. Lamétherie, v. 2. 540.

The elastic Bitumens were first noticed at Castleton, in Derbyshire in 1786. Perhaps their general resemblance

to the Caout chou, or Indian rubber, discovered about half a century ago, might in a great measure be the cause of their being noticed. It is curious they have never been discovered elsewhere, although Petroleum, Naphta, and analogous substances, as Mattha, Mineral Tar, Pitch, and Asphaltum, which are nearly related to the above, are found in many parts of the world. These always differ from the vegetable substances of the same nature (viz.) common Tar and Pitch, by their peculiar odour, which somewhat resembles oil of brick, a kind of burnt oil. We cannot at present account for the elasticity, otherwise than in the words of Mr. Hatchett: "From what I have already related, I suspect that the elastic property is occasioned by the interposition of very minute portions of air, or some other elastic fluid between the parts of the Bitumen, and that this takes place by means of some unknown cause at the time of formation; for, when these Bitumens are melted, the elastic fluid is liberated, and the mass loses that fine spongy texture which I suspect to have been the cause of the elastic property" It is found oozing out of rocks. The present specimen is attached to common Limestone, mostly Shinkstein: see p. 81 Brit. Min. It is nearly the softest of the elastic sort: some parts of it are almost in an oleaginous state, and stick to the fingers, nearly the colour of common India rubber but will not stretch out like it, although it springs to its form after compression.

Soft Elastic Bitumen, approaching the appearance of India Rubber.

Tab. 105.

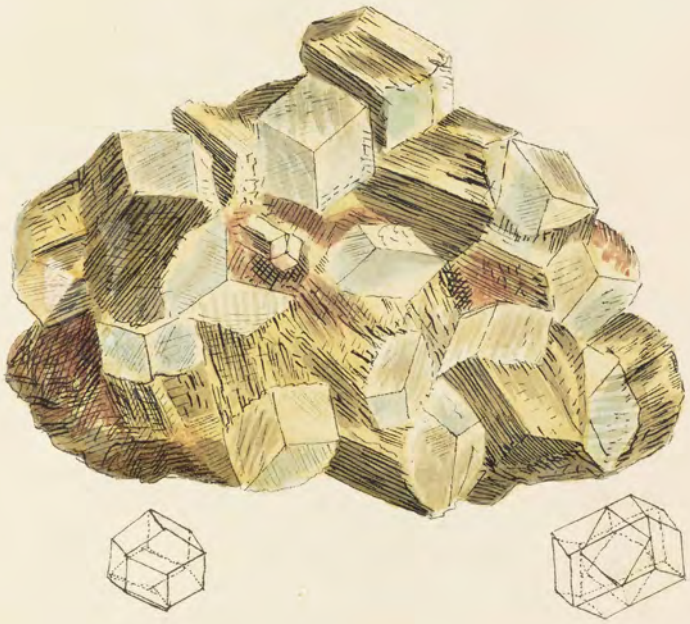
Calx carbonata; var. dodecaëdra.

Dodecaëdral crystallized Carbonate of Lime

Class 2. Earths. Order 1. Homogeneous.
Gen. 1. Lime. Spec. 5 Carbonate of Lime.
Div. 1. Crystallized.

Syn. Chaux carbonatée basanitaire $\frac{R\ 1}{1\ D}$. Haüy, 2. 142.

This is a scarce kind of Carbonate of lime, and but for the modifications might be taken for a Garnet as being a rhomboidal dodecaëdron — The fracture of Carbonate of Lime is very apparent in it; as well as the shapes of the primitive rhombs, which will be found to agree with the figure of the fracture: and are placed in such a manner as to form the dodecaedral figure. the column is formed of laminæ placed on the face of the rhomb decreasing from the lateral edges. Its termination at the ends in the form of the equiaxe. — see the middle figure The whole is a sort of inverse crystal: the column formed contrary to the usual mode. This specimen came from the North.



Dodecaëdral Carbonate of Lime.

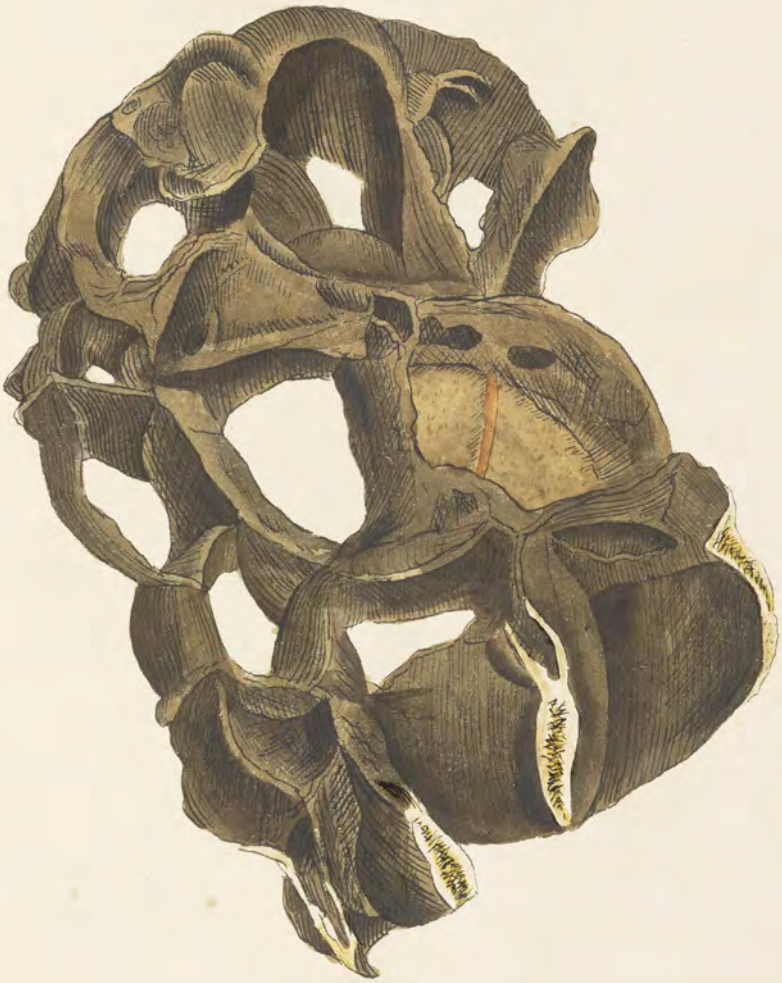
Tab. 106.

Silex Quartzum.

Quartz Septarium.

Div. 2. Imitative

Quartz appear in a great many varieties. this from its dull look has been taken for Lead. The hardness & sharpness of the delicately acute edges, soon betray it, & the fractures show the crystallization. It seems natural to most Quartz to have been in solution. here it has formed itself in the cracks of Clay for whatever might have held the Quartz in solution, might, at the same time have decomposed the clay. which however, must have been dry enough to have cracked & formed sharp & neatly distinct figures, shown by the Quartz, the clay would have been baked if fire had exposed the Quartz: but the clay is in its original state. this specimen came from Cumberland. Mr. Oliver had a piece about 1 foot in length from which the clay had apparently been washed out, chiefly on one side. this is remarkable for the incurved structure of the Septa. Say from contraction in cold or frost, giving out much of its water in the fissures which latter being impregnated with Quartz (which may be crystallized from a saturated solution in any medium.) the clay may then be washed away {common Clay is mostly a mixture of Silex and pure argilla, and is often so called when the Quartz contained in it amounts to 60 or even 90 per cent.}



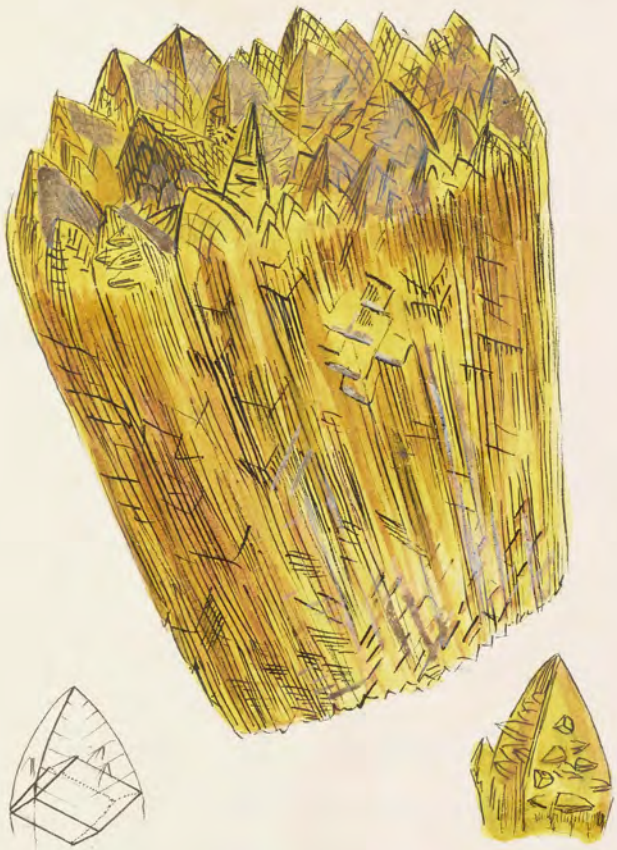
Quartz in form of a Septarium.

Tab. 107.

Calx carbonata; var. inversa.

Inverse Crystallized Carbonate of Lime.

Carbonate of Lime has been remarked at Portland Island for its fine Topazine colour. These crystals are not unuommon in other places, but often found in fissures of Portland Stone. The Stalagmites from Bath, Yorks. &c show the same substance generally less mixed, & the crystallization more or less in specimens which often accord with this in form: This specimen terminates in acute rhombs somewhat rounded, forming a pyramid upon the obtuse angle of the nucleus: See the left hand geometrical figure. These often have some crystals formed under the same circumstances on the sides; & observe, that these smaller ones are probably formed at a time when the others are nearly perfected, as the crystallization is somewhat independent; yet they were enabled to shift so into the larger ones, as to be of equal solidity with the rest of the mass.



Sugar candied, like Carbonate of Lime, with a peculiar Crystallization.

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This two-volume set was purchased by me in February, 1973 from a Midwest bookdealer. It was bound by myself in 1973. Pencilled numbers on some plates indicate correspondences with the volume and plate of the original printed edition. The present work is all hand lettered, drawn, and watercolor painted by a certain Martha Proby.

John Sinkankas